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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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CONTENTS

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We print this week a letter from Mr. Griffin which is worth careful attention. The point made is one which the *Railroad Gazette* has often brought out: that cast-iron wheels as now made and at present costs are a source of danger under 50-ton cars, and that a general understanding and agreement about car wheels ought to exist between all roads exchanging cars, since the damage from a broken wheel occurs wherever the car may happen to be running, regardless of where it was built. The author offers no solution, but merely states his case. The *Railroad Gazette* will welcome full and free correspondence on the subject.

In 1899 some fast passenger locomotives having cylinders of 19 in. diameter with a piston stroke of 26 in. were built for the Lancashire & Yorkshire Railway. These cylinders were steam jacketed and the steam was controlled from the cab. The construction was an experimental one and a recent inquiry about the results obtained shows that these results tally with those so frequently encountered in stationary practice. There is a certain theoretical advantage in the use of the steam jacket that does not appear in practical operation, and for that reason it has never been extensively used. In the case of the Lancashire & Yorkshire locomotives, it was not found, after continuous experiments, that it was worth while to steam jacket any more cylinders. The steam jackets apparently had the effect of preventing the accumulation of water in the cylinders, and it was thought that a certain amount of economy was secured by their use, so long as they were carefully watched. That is to say, a good man got good results out of them, while an inferior man got no better results than with the ordinary engines. But they gave trouble from a mechanical point of view, and it was decided that it was not worth while to continue them. Experiments were also undertaken on the same road with a small superheater by which very dry steam was delivered to the cylinders, but owing to the small size that was used a sufficient degree of superheat was not obtained. The experiments were valuable, however, in pointing the advantages to be obtained from a system of this kind, and when the Schmidt superheater was developed in Germany and the results that were being obtained with it became known, a number of engines were equipped with it, and have shown a saving in many instances of 20 per cent. Besides this direct saving, it has been possible to use a lower steam pressure and thus increase the life of the boilers while at the same time there is a better steam pressure and a higher temperature in the cylinders.

Australia has so far recovered from its three-years' drought that the people are discussing projects for new railroads, especially a transcontinental line. By far the larger part of the population and cultivable land are within 200 or 300 miles of the east and south coasts; there are important mining interests not far inland from the southwest coast; and very little population on the northwest; while the vast interior is mostly barren, with some grazing ground. But it is exactly on the northwest that Australia comes nearest to the world's great trade route from Europe and India to China and Japan. English steamers to Sydney take about 18 days from Colombo, Ceylon, eight of them along the stormy south coast of Australia. To Darwin bay, on the northwest coast, the time is 10 days less, and the railroad journey across the island, about 1,800 miles, would at most require but five days. There is already a railroad from Port Darwin for 146 miles southeastward, and from Sydney several hundred miles toward the northwest. But such a line is objected to by Melbourne, which is on the south coast near the southeast corner of Australia. It would have one of its own lines extended to cross the continent to the northwest; and Adelaide, which is still further west on the south coast, would have the railroad extend more nearly from south to north, along the transcontinental telegraph line. And if this cannot be done, it would prefer an extension of its railroads westward not far from the south coast to Fremantle, the port of West Australia (near the southwest corner), which is 1,500 miles southwest of Port Darwin. This would enable passengers to substitute a rail journey for the sea passage along the south coast to Adelaide, Melbourne and Sydney, but would probably not serve as a freight route. Local interests prevent any union on one route. Sydney and Melbourne, the present great trade centers for exports and imports, both near the southeast corner of Australia, fear the establishment of a great port at Port Darwin, which is so much nearer the great interna-

tional trade routes; though it has very little productive country within a thousand miles. Only the general government of the now united colonies would be likely to be able to carry through such an enterprise, the larger part of which would be in national territory, formerly the north territory of the colony of South Australia, a country, mostly barren, extending about 1,000 miles from south to north, and more than 500 from east to west. It is not expected that such a line, that is, the part yet to be built, would have any appreciable local traffic for some years to come; and it has been estimated that one through train a week would be sufficient for the business.

To learn how much of convenience and cost-saving can be secured to the maintenance of way department from a portable blacksmith shop, M. L. Byers, Chief Engineer Maintenance of Way of the Missouri Pacific, last fall had an outfit arranged for this purpose. It consisted of two box cars, one housing the blacksmith and his helper, and the other the shop. The latter included a forge, and the necessary tools, duplicate parts and supplies needed for repairing hand cars, frogs, switches, tools, etc. The outfit is moved by local freight trains. About one day is needed to do up the work of an ordinary section, and a longer time where the work of two sections is done at one point, or where there is a large yard. For repairing frogs where there is considerable traffic duplicates of the frogs to be fixed are put in the track while the work is being done; but when the traffic is light, or there is not much work to be done, the frogs are taken from the track, repaired and replaced under the protection of flagmen. The proper adjustment of guard rails is looked after at the same time, and section tools are sharpened and repaired. It has been found that the life of frogs can be extended considerably by repairs given on the ground in this way. The cost for labor and material in repairing about 225 main track spring frogs has averaged about $3.75 each. The fact that these frogs have not needed to be shipped justifies the opinion that the plan of field repairs is an economical one; particularly when the economies effected in repairing switches, tools, hand cars, etc., by saving the trouble and delay of sending them away for repairs, are taken into account.

The up-state New York Public Service Commission, on May 7, handed down a decision on the petition of the Lehigh & Hudson River Railway Company for leave to execute a supplementary mortgage and to issue bonds secured by the mortgage to the amount of $300,000. In asking the consent of the commission to issue these bonds, the first statement of the railroad company (afterward amended) was that the intended use of the funds was to reimburse the treasury of the company for part of the amounts paid by it on account of the construction and purchase of the Orange County Railroad, but the commission disallowed these reasons, holding that the Public Service Commission law permits capitalization in New York for four purposes only: (1) for the acquisition of property; (2) the construction, completion, extension or improvement of its facilities; (3) the improvement or maintenance of its service; (4) the discharge or lawful refunding of its obligations, provided the proper commission gives a certificate of reasonable necessary and authorizes the issue; and that, since part of the funds asked for were to be used in restoring funds already expended from the treasury, the terms of the statute were not complied with. It is easy to see the commission's line of argument, and we need go no further back into railroad history than the Chicago & Alton affair for an instance of genuine harm done a railroad property by capitalizing betterment work done for a series of years out of income, on so high a basis that the company's future borrowing power was seriously impaired thereby and the value of its securities was diminished. But it looks as if strict application of the principle laid down in the Lehigh & Hudson River case was going to do a great deal more harm than good. Like the Interstate Commerce Commission's depreciation system, it puts a premium on capitalizing all new work. It has been one of the best traditions of American railroad development that as much work as possible is done out of income—sometimes temporarily, sometimes permanently. At times when money costs a great deal, a road with an abundant cash surplus will pay its construction bills out of this surplus; at times when money is cheap it will issue long-term securities to restore its surplus—if one chooses to describe it in that way. It would be equally fair to say that the long-term securities were issued to pay for the construction work temporarily financed by means of the surplus; a process which saves money for the shareholders and saves time for all concerned. Moreover, if the company is prosperous, it will frequently omit to finance these improvements paid for out of surplus, but will let them stand to the permanent benefit of the values underlying the outstanding securities. The system gives flexibility of the highest value, and has very seldom been abused, but by the construction which the New York Public Service Commission places upon the law, it is henceforth impossible in New York. In doubtful cases it will be to the interest of the railroad company to issue securities at the start, whereas under the present system it will frequently happen that new construction on a small scale will be done without issuing any capital at all. There are a great many kinds of occasional ills for which a universal preventive can only be applied at very great disadvantage. We get along very well under compulsory vaccination, but if the Pasteur treatment was required of everyone, there would be riots; yet it is very clear that the Lehigh & Hudson River ruling of the New York Public Service Commission, like the interstate commission's depreciation and the obstacles which Massachusetts places to raising new securities, is a heroic kind of Pasteur treatment which may at long intervals save a life, but is sure to cause a great deal of unnecessary sickness in the meantime.

A well-informed observer remarked recently that the three most serious causes of errors by trainmen are: (1) mental inefficiency due to drinking (not drunkenness); (2) mental dulness due to not taking adequate rest when off duty; (3) taking chances, contrary to the dictates of good judgment. It seems to us that this is a very plausible theory, and we have no doubt that it is based on a careful diagnosis. It is significant that all three faults are of a moral nature. In other words, the first element needed in their correction is a desire or purpose to improve, on the part of the faulty person himself. This shows most forcibly how futile must be all changes in method and all mechanical aids, unless the persons to be dealt with are men of some strength of character —men with consciences, who do some intelligent thinking for themselves. The man who drinks "moderately" yet constantly is a more difficult problem for the superintendent than the one who gets intoxicated; and he often needs as much backbone as does the drunkard, if he is going to try to make himself thoroughly efficient. Neglect to take the full amount of sleep needed is also a habit which is the result of, or at least is perpetuated by, a mental infirmity that needs a good moral backbone for its cure. This is perhaps the one danger most difficult for the superintendent to reach. The night worker who neglects to sleep in the day time as he ought to can delude himself into the notion that he does not need so much sleep as the normal worker, and in case of failure in his duty he will claim that sickness in his family or some other excusable irregularity forced him into this neglect of his health. That this defense often is utterly false does not help the superintendent much in his endeavors to demolish the claim and maintain efficient service. Surely nothing more useful for the promotion of the safety of trains could be done, if only the genius could be found to do it, than to educate young men's consciences in this matter. The reader will recall the confession of a well-known railroad manager, printed not long ago, of how he used to go to ball games in the day time, at the risk of impairing his efficiency as a telegraph operator the following night. Drinking too much, and keeping awake too much are, however, mild delinquencies compared with "taking chances." But while the cure of this vice is essentially a moral issue, it may be easier to accomplish than in the cases of the other two, for it is easier to show the folly of it. The engineman who runs the risk of reaching a meeting point when he knows that he lacks two minutes of the necessary time, does so largely because he has not coolly measured the risk; and this he can be trained to do, if the superintendent is determined. One cause of this kind of recklessness is the indifference of conductors; but the enforcement of regular, intelligent and prompt co-operation between enginemen and conductors is a thing wherein superintendents can greatly improve if they set out to do so. After all of the improvement in the instruction of trainmen that has been accomplished in the last ten years, and the increased dissemination of knowledge of train rules, we should be loath to believe that enginemen of experience would take chances, with their eyes open, were it not that instances are reported now and then in the government accident bulletins. A road sending in an accident report containing such a phrase as "took chances" would seem to offer a good field for the government accident investigators—who have not yet been appointed.

STRICT CONSTRUCTION OF SAFETY APPLIANCE LAW.

The strict construction put upon the anti-trust law a dozen years ago by Justice Peckham, of the Supreme Court of the United States, in the trans-Missouri Freight Association case, when he held that a combination of competitors, however innocent and beneficial, was illegal, has now a striking counterpart in a decision rendered last Monday by Justice Moody, of the same court, holding that the law requiring that the drawbars of empty freight cars shall be 34½ in. high (from the level of the tops of the rails) must be exactly complied with. To run a car having drawbars 34¾ in. high, when empty, or 34¼ in. high, is illegal. This opinion appears in the suit of Taylor against the St. Louis, Iron Mountain & Southern, arising in a court of Arkansas and appealed by the railroad company from the Supreme Court of that state to the Supreme Court of the United States. By parity of reasoning the law requiring all cars to have automatic couplers in good condition must be construed with the utmost rigidity. To run a car with a broken drawbar, even so little as five miles to a terminal, for repairs, will make the railroad liable to the full penalty of the law.

To the present decision there is no dissenting opinion, though Justice Brewer concurred only in the result, not in the entire language of the opinion. The decision incidentally sustains the right of Congress to delegate to the American Railway Association and the Interstate Commerce Commission the duty of fixing a standard height of drawbars for freight cars. As to the question of adhering to the standard height, it was contended by the railroad company that it had employed men whose business it was to see that the drawbars were of the standard height; that it had furnished them material and appliances to keep the drawbars at the standard height; that its employees were capable; in short, that reasonable care had been used to keep these appliances at the standard height. But the court holds that the statute is absolute, and that if the road fails to have the cars at all times in such condition as to comply with the statute, it is liable to an employee injured while using such unlawful couplers. This overrules a number of contrary decisions which have been made by district and circuit courts.

As to the claim that this strict construction would work hardship on the railroad company, Justice Moody said:

> "Where an injury happens through the absence of a safe drawbar there must be hardship. Such an injury must be an irreparable misfortune to someone. If it must be borne entirely by him who suffers it, that is a hardship to him. If its burden is transferred, as far as it is capable of transfer, to the employer, it is a hardship to him. It is quite conceivable that Congress, contemplating the inevitable hardship of such injuries, and hoping to diminish the economic loss to the community resulting from them, should deem it wise to impose their burdens upon those who could measurably control their causes, instead of upon those who are in the main helpless in that regard."

SECONDARY STREET RAILWAY FINANCING.

Amid greater and more sensational events a new phase of street railway operation in Massachusetts bearing directly on street railway finance has almost escaped attention outside of that state. It is the extensive movement there toward the increase of railway fares. It cannot, as yet, be described as general. It does not affect much the fares in the cities of the state. But on country and cross-country lines the increase has already in many cases been adopted. It ranges all the way from the substitution of six cents for the familiar and convenient "nickel" up to the added nickel for runs not always long; and it is based, nominally, on the increased cost of labor, materials and the expense of operation generally. Actually it strikes back to conditions of street railway financing peculiar to Massachusetts and which suggest a secondary stage of such financing there and elsewhere.

It is a very familiar fact that during the last two decades of electric street railway expansion in this country while floods of water have been poured into both stock and bonds of street railway corporations and the unscrupulous "promoter" has been high in the saddle Massachusetts has insisted sternly on honest capitalization based mainly on actual replacement value. It is not too strong a statement to say that her enforced capitalization in stock and debt of about $50,000 a mile has fixed an American standard of just capitalization, contrasting strikingly with more than double that amount in Connecticut, and with the dropsy in such states as Rhode Island and Pennsylvania, saying nothing of the acuteness of that disease in the New York City lines. But honest financing in the Massachusetts trolleys has been attended with one unlooked for result. Theoretically it would argue high prosperity for her trolleys and few receiverships. In fact, returns on her trolley investments have not been high and receiverships have been many, while just over the line in Connecticut, under "high" trolley finance only one out of some 30 original street railway corporations has suffered reorganization—though it must be said that the contrast with other states would by no means be so impressive. The seeming paradox, however, is easily enough explained. In Massachusetts, with her 34 cities and dense population, excessive trolley building ensued *spite* of restrictive law and ensued under unusually strong competitive conditions. Low fares and good services—at pretty high cost in many cases—have been the rule as compared with other states; and, finally, to a much less degree than in other commonwealths have there been in Massachusetts the big trolley combinations in which the strong lines of high earning power have carried the weaker ones.

There comes now, in that state, a readjustment of the situation expressed in higher fares. This is interesting in itself. It is doubly interesting when correlated with the recent dictum of the Massachusetts special commission in favor of allowing street railway companies as well as other corporations, to issue new stock, no matter what its market value, at par instead of the market price and thus reverse the Massachusetts statutory rule in operation for 15 years. This is to be interpreted as the proffer of a higher reward than hitherto on street railway enterprise. In other states the proposition goes much further. Promoters are proclaiming loudly that, with profitable trolley territory to a great extent exhausted, a watery "bonus" of some sort must be an element in every new trolley project. Succinctly stated it has been "no bonus no trolley," though the claim has not been for a bonus of the size in the earlier days of trolley promotion. In the last Connecticut legislature this claim was made openly and, strangely enough, prevailed over a dozen or more vetoes of the Governor. "Give us the trolley no matter what its financing" was the dominating cry in the same commonwealth where the watering of street railway securities has been not only scandalous in amount but the object of the sharpest popular criticism.

In this secondary stage of street railway development in this country where the trolley project is necessarily breaking away from the cities and from dense populations into rural communities and into long distance lines it will be edifying and instructive to observe how the rival forces outlined are to work out. On the one hand there is the general outcry against watered stock, the assertion not unfounded in fact, that it implies poorer service and higher fares, and the demand that the lines be desiccated by new valuations based on actual cost. On the other hand, particularly when one panic period is past and capital becomes more free and fluent, we are certain to find fresh appeals to legislatures to validate the bonus in stock or bonds as the price of new electric lines. The material and localized temptation will be set against the same policy of a state and the same men who uphold that policy will be found yielding to temptation and sacrificing consistency when it comes to their own interests or that of their immediate constituency. We may also see the incongruity of one fiscal policy applied to lines in operation; another and entirely reversed policy to projected lines. As there is no middle way between honest and inflated capitalization some of the future results promise, to say the least, to be satirical.

Train Accidents in April.

April, which may always be expected to show the lightest accident record of the year well maintains its reputation; with the difference, this year, that it follows two other light months. The three together, February, March and April, make a showing more favorable than any three months since a time when the railroad system of the country was very much smaller than it is now.

None of the train accidents in the present list is of sufficient magnitude to be put into our "prominent" class; but we append notes of two of them, and also give, following the list, some notes on a number of accidents which do not come within the term "railroad train accident" though they are of a kind which should be mentioned here.

The collision of passenger trains at Cleveland, Ohio, on the 30th, is said to have wrecked the engines and the baggage cars of both trains, but fortunately only four persons were seriously injured. The accident was due to the misplacement of a switch just in season to send a southbound passenger train on to the side track, where it struck a northbound train. The switch was thrown, just before the train came along, by a man who is believed to be

insane or demented. Having been arrested and questioned, he claimed to have obeyed a shout from a brakeman of the standing train; but the brakeman was attempting to make the man straighten the switch, having observed that it was wrong.

The collision near Rock Glen, Pa., on the 20th, which resulted in the death of a fireman, was between southbound passenger train No. 15 and a locomotive running in the opposite direction, which appears to have encroached on the time of the passenger train. The passenger was running about 35 miles an hour when it struck the empty engine, and both of the engines were wrecked and thrown into the ditch. The baggage car of the passenger train was crushed, but only one passenger was badly injured.

PRINCIPAL TRAIN ACCIDENTS IN THE UNITED STATES IN APRIL, 1908.[1]

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
*†2.	Chic., Burl. & Q.	Spanish Lake.	rc.	P. & Ft.	1	4
15.	P., C., C. & St. Louis.	Collier, W.Va.	xc.	Ft. & Ft.	2	0
20.	Buf., Roch. & Pitts.	Rock Glen.	bc.	P. & Ft.	1	20
30.	Erie	Cleveland.	xc.	P. & P.	0	5

Derailments.

Date.	Road.	Place.	Kind of train.	Cause of derlmt.	No. persons reported Kil'd.	Inj'd.
3.	Wabash.	Catlin, Ill.	Pass.	b. rail.	0	5
10.	A., T. & Santa Fe.	La Plata, Mo.	Pass.	d. track.	0	4
14.	Northern Pacific	Glendive, Mont.	Pass.	acc. obst.	2	1
17.	A., T. & Santa Fe.	Toluca, Ill.	Pass.	malice.	1	0
*20.	Great Northern	Summit, Mont.	Pass.	slide.	0	0
23.	Chic., P., & St. Louis.	Alton, Ill.	Ft.	washout.	1	0
24.	Erie.	Canisteo, N.Y.	Pass.	b. tire.	0	3
25.	Seaboard Air Line.	Tucker, Ga.	Ft.	d. bridge.	2	1
27.	St. Louis & San Fran.	Stanley, Okla.	Pass.	unx.	0	20
28.	Pennsylvania	So. Elizabeth.	Pass.	acc. obst.	1	3
30.	Pennsylvania	Pittsburgh.	Pass.	unx.	0	4

Other Accidents.

7.	New York Central.	Floodwood.	Ft.	boiler.	0	7
9.	N. Y., N. H. & H.	Derby.	Ft.	boiler.	0	3

Of the dozen electric car accidents reported in the newspapers in April one resulted in the death of nine persons and three others were notable. The fatal one was a butting collision on the 28th between cars of the Detroit, Jackson & Chicago near Ypsilanti, Mich. Both the eastbound and the westbound cars were heavy and were running at high speed, the collision happening on a curve where the view was short. The responsibility is laid at the door of the motorman of the eastbound car, who was killed. The running time of this car had been changed, beginning on the day of the collision, but no evidence is published to show that this was the cause of the motorman's error. Whatever may have been his assumption as regards his right to the road, he ran at full speed past the side track where he should have waited. According to a press despatch the state railroad commissioner of Michigan attributes the collision to faults in the despatching system, and will take steps to secure the adoption of "a standard system of despatching"; he will call a meeting of railroad officers for this purpose. What is meant by "a standard system" we do not know; but the commissioner should know that the best standard in existence is unsatisfactory without the use of the block system along with it. The improvement of the American despatching system has been discussed for 25 years, but it still remains unsatisfactory. Those roads which have made the most intelligent and persistent attempts at the improvement of the despatching system are now adopting (or extending) the block system, the use of which removes the necessity for the impossible refinements of the despatching system. This action of these roads would seem to indicate that efforts to accomplish a satisfactory degree of safety by the use of the despatching system are likely to be fruitless.

At Chicago, on the 7th, the leading car of an elevated railroad train jumped the track near Indiana avenue and one end of it fell to the ground, lodging in the back yard of a residence. The rear end of the car, however, remained leaning against the elevated structure. Of the 50 persons in the car, eight were seriously injured. On the Washington, Baltimore & Annapolis electric road, near Crownsville, Md., on the 12th, there was a butting collision of cars in which eight persons were slightly injured. In this case it is said that a special car standing on a side track was mistaken by the motorman of the eastbound car for the regular, which he should meet.

Near Williamsport, Pa., on the 22d, nine lumbermen were killed and 15 others seriously injured in the wreck of a runaway train of logs; but this is not to be classed as a "railroad accident" as it occurred on a logging company's track.

A collision in Australia, on the 19th, killing 41 persons, and one in Mexico, on the 24th, killing 28, have already been reported in the *Railroad Gazette*.

[1] Abbreviations and marks used in Accident List:

rc.....Rear collision.
bc.....Butting collision.
xc.....Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.....Broken.
d.....Defective.
dr.....Defect of roadway.
eq.....Defect in car or engine.
n.....Negligence.
unf.....Unforeseen obstruction.
unx.....Unexplained.
derail.....Open derailing switch (negligence of engineman or signalman).
ms.....Misplaced switch.
acc. obst..Accidental obstruction.
malice....Malicious obstruction of track or misplacement of switch.
boiler.....Explosion of boiler of locomotive on road.
fire.....Cars burned while running.
Pass.....Passenger train.
Ft.....Freight train (includes empty engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

New York Central & Hudson River.

The annual report of this company for the calendar year in 1907 is of quite unusual interest, for several reasons. It will be recollected that the first train operated by electricity on this company's line ran into Grand Central on September 30, 1906, and that on December 11, 1906, regular service with motor cars for the Yonkers local trains was begun between the Lexington avenue temporary terminal and the present terminus of electric operation on the Hudson division at Highbridge, the trains being hauled thence by steam locomotive to Yonkers. Therefore, as far as electrification is concerned, 1907 represents the first complete year of operation.

The difficulties have been very great. Yard and station changes have been continuous. The New Haven road has not even yet got to the point where it hauls all trains out of its part of the station by electricity, and the New York Central has consequently been impeded by the long-drawn-out continuation of the construction stage of the work. Both the New York Central locomotives and the New Haven locomotives fall short of satisfactory performance, one company experiencing its principal difficulty in obtaining full tractive power; the other in the effect of the electric locomotives upon the track. To add to these difficulties, the New York Central has not yet been able to extend the zone of electric operation beyond the boundary at Highbridge on the Hudson division, and delays at these points are none the less irritating because they are inevitable. The multiple-unit trains have proved to be a heavy drag on the steam locomotives used to draw them over the portions of their run which have not yet been put under electric operation, and this has occasioned further delays.

To add to the embarrassment of its local service, the west side extension of the Interborough Rapid Transit subway has taken a great deal of the short haul traffic and made many of the commutation trains entirely unprofitable. While following out a natural desire to economize in a period of depression by reducing unprofitable train service, the company has encountered severe local opposition and has had to comply with the train service requirements of the Public Service Commission. But it can be freely said that the suburban difficulties have been gradually clearing away, and may be expected to make themselves less and less felt, with each succeeding month. The great advantages of operating this kind of traffic by electricity are bound to make themselves felt as soon as the unsatisfactory mixture of steam and electric service in the same territory is done away with. Nevertheless, these suburban difficulties make perhaps the most characteristic feature of the company's year.

Another very interesting development, brought out during the past year, has been the practical demonstration of the value of the company's "equities." The market price of New York Central has always been higher than would have been justified by its available surplus earnings, and the reason for this, apart from the geographical location of the lines, has lain in the fact that some of the subsidiary properties, notably the Lake Shore & Michigan Southern and the Michigan Central, were earning free and clear a good deal more than they were paying out in dividends and were putting the money back into permanent improvements which increased earning power. The actual value of these "equities" was clearly shown this year. Net earnings of the New York Central in 1907 after all expenses were $3,262,087 smaller than they were in 1906, but by the simple device of increasing the dividends of subsidiary companies, the company increased its "other income" $3,768,313, so that the gross income available for charges and dividends was half a million dollars greater in 1907 than in 1906, and net income after charges, including the interest on the three-year 5 per cent. gold notes of 1907, was $116,182 greater than in 1906.

Gross earnings were $98,369,060, as against $92,089,769 in 1906, the increase being occasioned in considerable part by the large additional tonnage both of bituminous and anthracite coal as compared with the unusually light tonnage during the first six months of 1906, at the time of the strike in the bituminous coal fields. The average freight haul for the year shows a slight increase, but the relative increase in coal tonnage as compared with that of higher class freight produces the decrease in the average haul per ton per mile. Passenger earnings were $29,837,859—just about half the

freight earnings—an increase of $1,269,081, due entirely to the volume of business interchanged with foreign lines, since commutation business continued to decrease, doubtless for the reasons already outlined in this review. The company has an important equity, if it may so be called, in the undeveloped state of its commutation business at the present time in densely populated territory, and when it gets its electric operation in really first class shape, it can add very materially to its passenger profits from this source. The profit of an ordinary commutation service, with steam trains, is a moot point; at best, it is doubtful, but an electric service permitting of very frequent trains in relatively small units without unduly high costs is probably going to change this, as soon as it gets a fair chance to do so. The results will be watched with great interest.

At the close of 1907, the Lake Shore dividend was increased from 8 to 12 per cent.; the Michigan Central dividend, from 4 per cent. to 6 per cent. (annual basis), and the New York Central rate from 5 per cent. to 6 per cent. In connection with the increased stock, of which $449,300 was issued during the year, this increase in the dividend rate cost the company $2,885,036; the entire dividend payments in 1907 amounting to $10,717,920. A quarterly dividend of 1½ per cent. was paid in January, 1908, in spite of the great falling off in earnings, but at the March meeting the road was put back on a 5 per cent. annual basis, and the April dividend was 1¼ per cent. Prior to the panic, the company was well able to pay the higher rate, in spite of its very large legitimate capital requirements, and it may be surmised that it will be able to do so again before many years.

An agreement was entered into during 1907 between the New York Central and the Pullman Company, providing for Pullman car service for 25 years from January 1, 1905, and with the Western Union Telegraph Company, for telegraph service for 30 years from January 1, 1906. These contracts supersede all prior agreements with these companies and are more favorable in their terms to the railroad company. The company's holding of 5,748 shares of Boston & Maine stock, acquired during the previous year, was exchanged for an equal amount of the capital stock of the New Haven road during 1907. The New York Central's funded debt was not changed during 1907, but to obtain equipment for immediate requirements the New York Central, Lake Shore, Michigan Central, Big Four, and the Chicago, Indiana & Southern have become parties to an equipment trust dated Nov. 1, 1907, providing for an issue of $30,000,000 of equipment trust certificates, being 90 per cent. of the total cost of the equipment to be furnished under the terms of the agreement. J. P. Morgan & Co., and Drexel & Co. offered these equipment trust certificates in January, 1908, on the basis of about a 5¾ per cent. yield to the purchaser.

Since the publication of the report, perhaps the most important item of news about the company is the fact that the option on the controlling interest in the New York, Ontario & Western, given during 1907 to the New York Central by the New Haven road, and expiring early in January, 1908, has been extended indefinitely, probably until the New Haven-Boston & Maine tangle is straightened out.

Maintenance of way per mile of road operated in 1907 was $3,295, against $3,052 in 1906. Repairs and renewals of equipment cost $2,242 per locomotive, against $2,038 in 1906; $836 per passenger car, against $723 in 1906, and $76 per freight car, against $60 in 1906. The company spent for additions to property and charged to capital account $6,400,000. About $1,000,000 was spent in double-tracking the West Shore railroad between Churchill, N. Y., and Syracuse junction; third and fourth tracks between Lake Crossing, Mass., and South Framingham, on the Boston & Albany, cost $184,000, and third track at various other places on the Boston & Albany cost an additional $379,000. Maintenance expenses used up about the same percentage of gross earnings last year as in 1906, but conducting transportation increased from 40.47 per cent. of gross earnings to 46.76 per cent.

Traffic statistics show slightly increased efficiency of operation. The average trainload of revenue freight was 419 tons carried per train-mile, an increase of 16 tons over the previous year. While the empty freight car mileage increased from 249,000 to 278,000, the average number of empty freight cars per train-mile remained precisely the same, that is 12, in 1907 as in the previous year.

The principal statistics of operation were as follows:

	1907.	1906.
Mileage worked	3,782	3,784
Freight earnings	$59,406,447	$54,824,283
Passenger earnings	29,837,859	28,568,778
Gross earnings	98,369,060	92,089,769
Maint. of way and struct.	12,462,047	10,718,599
Maint. of equipment	14,823,631	14,569,057
Conducting transportation.	45,995,903	37,267,589
Operating expenses	75,803,334	64,953,695
Net earnings	22,565,726	27,136,073
Other income	11,476,051	7,707,738
Gross income	34,041,777	34,843,811
Net income	11,083,829	12,275,907
Dividends	10,717,920	7,832,885
Appropriated for betterments	.....	4,108,261
Year's surplus	66,539	19,434

NEW PUBLICATIONS.

Practical Hydraulic Tables and Diagrams. By C. B. Housden, Superintending Engineer P. W. D. India. London and New York: Longmans, Green & Co. 105 pages; 7 in. x 4¾ in.

The object of this collection of tables and diagrams is to afford a means of quickly ascertaining the sizes and cost of the pipes required for a complicated system of water supply. Incidentally, they also apply to surface drains and underground sewers. They were originally designed for personal use and they bear the marks of this purpose even in their final form in that the compiler has overlooked the fact that the engineer who will use them is not as familiar with all of the methods and the abbreviations that are used as the compiler himself. Until this familiarity has been obtained, it is necessary to refer back constantly so as to see what the signs and symbols that are used refer to. This holds not only for the formulas but also for the tables and diagrams as they are presented in their completed shape for use. The value of frequent repetitions of the meaning of symbols cannot be too strongly emphasized where a book is to be used for reference and there is to be a search for one item of information only, regardless of what has preceded or what is to follow.

In a book like this, where the final results only are to be used and the steps in the process are not fully explained, it must be borne in mind that the user is presupposed to have a large amount of information on the subject, so that there is no review of the general principles of hydraulics. For this subject, only the methods of preparing the tables are given, and it will be necessary for the engineer to make himself perfectly familiar with these methods and back this familiarity with a further knowledge of hydraulics before the tables can be successfully used. This can only be accomplished by a careful study of the development of the formulas and their results from the start, and when this has been done the tables and diagrams will be found to be in such form that the determinations of size and capacity of the piping to be used will be rapidly made.

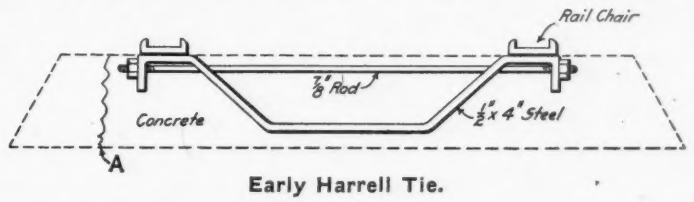
CONTRIBUTIONS

The Harrell Reinforced Concrete Tie.

Chicago, May 7th, 1908.

TO THE EDITOR OF THE RAILROAD GAZETTE:

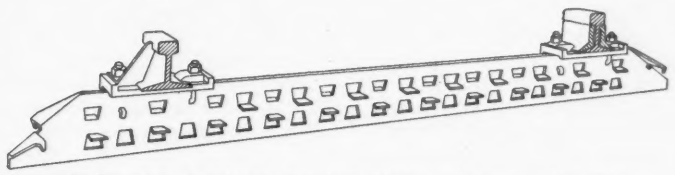
In the editorial on Metal and Reinforced Concrete Ties in your issue of May 1 you say there were 30 Harrell perforated vertical center-plate composite ties put in the Pennsylvania main line track near Harrison street, Chicago, in 1899. You state that they were all



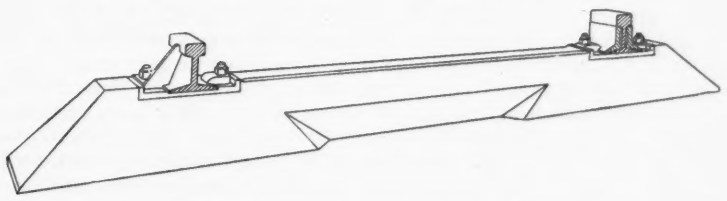
Early Harrell Tie.

removed within a year because the fastening was too weak; also that some of the ties were badly broken, and it did not appear that the design could be used for heavy traffic.

You were misinformed regarding the design of tie used. I send you herewith a sketch of the reinforcement used in that tie. These ties failed because of the weakness of the rail chair attachment, the lightness of the bolts used for clamping the rails and



Perforated Vertical Center Plate of Composite Tie.



Harrell Composite Tie.

Length, 8 ft.; depth, 9 in.; width at bottom under rail, 10 in.; width at bottom in center, 4½ in.; width of top, 5 in.; weight, approximately, 375 lbs. Reinforcing steel plate, 7 in wide, and ⅜ in. thick with 40 perforations 2 in. square. Bolts, ¾ in. x 4 in. Rails clamped to and bear directly on steel center. Rail plates and bolts can be renewed without disturbing the concrete.

the absence of reinforcement outside of the rail. The concrete in some of them broke at the point marked A in the sketch.

I also send you a drawing of the perforated vertical center-plate tie. The first ties from this design were made by McCord & Co. in 1901, 1,000 being made on contract at Hegewisch, Ill. These were tested in the tracks of the Illinois Car & Equipment Co.'s plant at Hegewisch and proved fully satisfactory. J. J. HARRELL.

Snow Fences.

Chicago, May 15, 1908.

To the Editor of the Railroad Gazette:

In your issue of May 8, page 636, I notice a statement in "Picked Up on the Road" which I know to be erroneous. Gulf says that snow fences were not common in this country until subsequent to 1893. I entered the service of the Chicago, Burlington & Quincy in October, 1882. In January, 1883, I made a trip over the entire line from Burlington, Iowa, to Denver, Colo., on a special. We also traveled some distance on the Humeston & Shenandoah (afterwards the Keokuk & Western and now part of the Burlington system), the Missouri Pacific and the Union Pacific. On all these roads as well as on the C., B. & Q. there were snow fences set up virtually along the same lines as we have them to-day.

I remember it distinctly because they were the first I had ever seen. From 1883 until 1893 I was employed on work that required my supervision of the taking down and storing snow fences for the summer and repairing same and setting them up in the fall.

As my duties along that line ceased in 1893 I know that it was prior to that time that snow fences were in general use throughout Illinois, Iowa, Nebraska, Kansas, Missouri and Colorado. I cannot say whether or not they were used further north at that time. If the Frenchmen did not adopt snow fences until 1890 they were certainly behind us. JAMES B. LATIMER,
Signal Engineer, Chicago, Burlington & Quincy.

For Better Car Wheels.

New York, May 18, 1908.

To the Editor of the Railroad Gazette:

In response to your invitation to present the car wheel subject again I will undertake to do so even at the risk of repeating some things that have been said before, and some things that are so well known that to mention them seems unnecessary.

No matter how old the car wheel story may be, no one can deny that it is a matter of increasing concern from year to year. Railroads may be constructed and operated according to one standard of merit or another. If the standard is good the results will correspond; if the standard is bad then the particular railroad in question will suffer. But there is one thing over which no railroad has control in respect to its particular standard of practice, and that is the car wheel. One of the leading American railroads has in the matter of its car wheel supply followed for years the plan of selecting its own materials conducting its own wheel manufacturing operation, and yet probably suffers as much as any other railroad of like magnitude with respect to the results obtained from wheels under cars running over its lines. The reason being that so large a proportion of its traffic consists of hauling cars built and owned by other companies, or even of its own cars equipped with wheels replaced on the lines of other companies. The same result obtains in great or lesser degree in the case of every railroad company endeavoring to live up to the standard of good practice in the purchase and use of wheels. If a car breaks down it is repaired and the cost charged where it belongs. If a rail breaks the penalty is paid by the railroad that purchased the rail, but the car wheel is purchased by any one railroad, to fail, perhaps, on some other, and allowing for the few dollars that may be recovered in the few instances that owners can be held responsible—the penalty is paid by the railroad on which the failure occurred. This one fact places the car wheel in the front rank of items for which any one railroad may have to pay the bill for the order of practice carried on by any other.

The failure of one wheel running under a car on tracks adjoining other tracks on which passenger trains with every part of equipment maintained at the highest standpoint of quality and efficiency may precipitate an accident as fatal to life and property as the failure of the most carefully constructed part of the passenger train. In these days of continuous operation of passenger and freight trains over tracks but a few feet apart there is little time or opportunity to avoid the results of such accidents and the whole operation becomes one in which all parts affect other parts—the failure of one involves disaster to another. Such observations are part of the old story—to repeat them as stated seems unnecessary, but the point is, are they true, and is the effort to guard against such dangers being exercised as energetically as should be. There is no doubt that the great majority of the makers and users of wheels give their best efforts under their control to safeguard such operations, and that there is a greater appreciation than ever before of the necessity of bringing the order of practice as near as possible to the best standard on the part of all concerned.

The difficulty seems to be to agree upon the way in which progress toward the desired end can be made. Taking it for granted that it is the desire of all concerned to bring the car wheel up to the necessary standard of safety and durability, the first necessity is to determine the conditions which have to be met and provided for in the present order of operations, compared with those that existed a few years ago, when the makers and users of wheels were better able to meet the situation. There is a vital necessity of prompt action in this respect because there appears to be differences of opinion on matters which after all are simple mechanical questions.

The increased load and speed have produced two effects on the wheel.

First.—It has become more liable to failure through inability to support the load.

Second.—It has been called upon to sustain greater physical and molecular changes in the parts immediately affected by breaking friction and the shocks and strains of service. As the result of investigation and study of present service conditions and as proved by statistics concerning them it may be conceded that the strength of the wheel *as a whole* is sufficient. The percentage of failure in this regard is not increasing; in fact, considering the great increase in hardship of service, it may be said that progress in this direction is most satisfactory. During the past few years the subject has received such attention and study from the wheel makers and railroad officials through the action of their representative associations that uniform standards of section and weight for different classes of service have been adopted and have been put into general use with a promptness seldom known in past experience.

The results of the second effect referred to are more difficult to provide for. There has been a marked increase in the percentage of wheels removed for certain causes, and whether this increase can be or should be prevented by the maker or user of wheels is a question that so far is responsible for a great deal of delay in finding the remedy.

Naturally the user looks to the maker to provide the remedy if possible. The average railroad mechanical officer is a busy man; he has many problems to solve that call for immediate action, and until general problems become acute he does not usually spend much time upon them. In this part of the car wheel problem a practical if not technical knowledge is needed, and it is not to be expected that such knowledge is possessed by all concerned. To make careful investigation, to seek information from those having it and to be governed accordingly, is after all the most that can be expected from the average railroad official of the kind.

On the part of the manufacturer, to study conditions of manufacture and service, and to make provision so far as the limits of possible cost and price obtained, will admit whereby wheels suitable for the increased service conditions may be supplied is about all that can be expected.

The natural tendency of both maker and user is to feel that the responsibility rests principally on the other man. That may be so, but when both are confronted with a condition which involves the safety of life and property, and that condition is becoming daily more critical, then it becomes the duty of each to find the remedy as quickly as possible.

To provide the remedy in this case must first depend on finding the cause. The defects referred to in which the increase is serious are confined to the wearing surface of tread and flange. Fine cracks in the surface coming in contact with brake-shoe and rail develop until groups of such cracks make the wheel defective.

Some railroad officials and some car wheel makers say that it may be possible to make certain changes in the quality of metal used or in the process of manufacture that will overcome this defect—in other words prevent its occurrence.

This statement disregards the fact that the repeated heating and cooling of the surface of any metal will inevitably produce similar effects, for the reason that rapid heating of the surface causes expansion which does not occur with the metal under such surface and unless the heating is gradual enough to permit the proper expansion of the metal as a whole, then the heated part must expand regardless of the fact that expansion does not take place in adjoining parts.

When the surface of the tread and flange of the wheel is quickly heated and expands, the fine surface cracks must occur. Considering the great number of times that such surface heating is caused by the friction of brake-shoes, there can be no question that the reason for the defects in question arises from the condition described. No metal used in car wheels can be free from such defects under such conditions. It may be that certain changes in material used will apparently produce better immediate results, but this will be due to the fact that trials of that description occupy a certain period of time, during which the defects are developing in the trial lot of wheels.

The condition that produces such defects is repeated many times

before its worst results accumulate and become plainly evident.

In any case railroads that have manufactured their own wheels, using the best of material, suffer as much from the defects referred to as those that have given much less time and trouble to the matter.

The conclusion that seems apparent is that relief will be obtained only by decreasing the severity of the conditions causing the defect or by providing some means of changing such conditions.

To find qualities of metal that will stand constant and excessive heating and rapid cooling and that will produce the conditions of safety and durability under such treatment, may be a future but certainly is not a present possibility. It therefore appears necessary to develop some other means of preventing the trouble. The need for some effective action is very great. Wheel manufacturers and railroad officials appreciate that fact. Not only does the great reduction in life of wheels cause a heavy increase in cost of operations but the menace of accidents that must result from the large number of wheels that are constantly having to be removed for the defects described is very great.

It is natural to conclude that if a large and increasing proportion of all wheels removed show flange defects, there is danger of accidents from wheels in service with similar defects. It is natural also that considerable time should be required to investigate and work out such matters, but after all the subject is about the most important practical one before the railroad public.

It appears from statistics that over 50 per cent. of all wheels are removed from service on account of flange wear and flange defects, and that the proportion is increasing. Some way must be found of meeting such a situation. There are about 20 million car wheels in use in America, of which over 95 per cent. are chilled wheels, the balance steel tired or solid steel wheels. A great deal has been said and written of the comparative merits and the demerits of each kind of wheel. That is probably a question that will be determined by service results.

The chilled wheels possess the advantage of low first cost, high relative scrap value and long life under proper conditions of service with very little expense of maintenance. The hardness of the wearing surface of tread and flange exceeds that of steel by about the relative difference in the proportion of combined carbon present in the metals.

Steel wheels have not been used under freight cars to a sufficient extent or for a sufficient time to afford very much knowledge of what they will accomplish and to what extent maintenance cost will be increased. Probably both classes of wheels have their advantages in point of wear and economy for certain classes of service, but these advantages will be determined by service results only.

If the situation is to be relieved by the use of steel wheels then railroads must certainly face a very heavy increase in first cost and maintenance charges. If it is to be by some modification of the chilled wheel then it is time for modifications to be tried. Railroads must have wheels that will do the work safely regardless of cost—to disregard this fact would be impossible. To allow the present condition to grow from bad to worse is not sensible.

Chilled wheel manufacturers have not changed their conditions of practice as much as might have been done to keep pace with the increasing demands of service, but this is largely if not wholly due to the fact that railroads in general have been unwilling to pay prices for car wheels that would admit of any such changes and improvements.

It appears now that railroads may take a different view in such matters, and it behooves the chilled wheel makers to take up the subject actively; otherwise the inference will become established that in the opinion of the majority of wheel makers improvements are not possible.

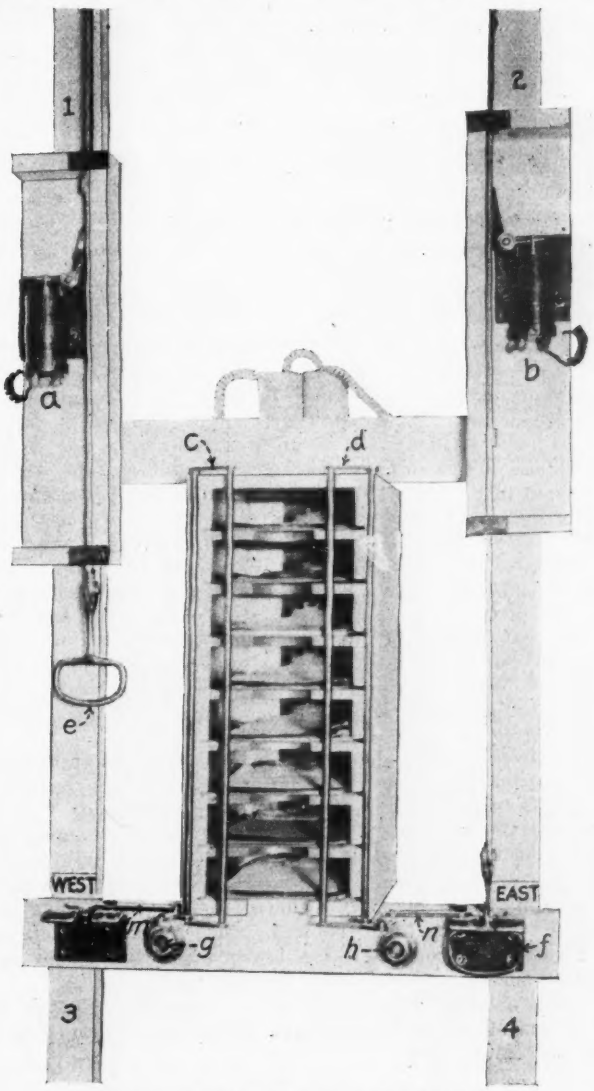
Of course such an inference would be absurd but only active work on the wheel makers' part will avoid its establishment. There is also the disinclination on the part of some wheel makers to concern themselves about such matters. In some particular sections of the country the use of heavy capacity cars has not yet attained considerable proportions, and wheel makers in such localities no doubt feel that they are not particularly concerned. The broad fact is, however, that the use of heavy equipment is rapidly increasing and that some way must be found of bringing the car wheel up to the point of greater safety and durability without much further delay.

P. H. GRIFFIN.

A Locked Cabinet for Train Orders.

The photographic illustration given herewith shows a safety device for handling train orders, invented and patented by W. R. Scott, Assistant General Manager of the Southern Pacific, at San Francisco, and E. M. Cutting, Supervisor of Signals of the Western division, of which Mr. Scott was formerly superintendent. The purpose of the invention is to keep operators from forgetting to deliver orders to trains, and this purpose is carried out by locking up the orders and blanks so that the operator cannot get a blank to use for making an order until his signals are displayed in the stop position. The different parts of the illustration are indicated as follows: 1, 2, 3, 4, frame; *a*, *b*, solenoid locks on signal levers; *c*, *d*, frames, in the nature of doors, by which the train order clips are locked in the cabinet; *e*, *f*, handles by which the signals are cleared; *g*, *h*, push buttons for closing electric circuits; *m*, rod connected to the door for preventing the locking of the handle of the signal lever in the clear position when clip boards are out.

The cabinet has as many shelves as may be required to furnish one for each train-order clip-board in use. These boards have at their back ends brass strips by means of which, when put in place on the shelf, they close each an electrical connection forming part of the circuits to the locks *a b* on the signal levers. With all the clips in place, the electric circuit is completed, so that by pressure on button, *g* or *h*, current from the battery is supplied to the solenoid *a* or *b* withdrawing the dog from beneath the boss on the signal rod and allowing the signal to be pulled clear. Either or both locks may be energized by pressing the appropriate button or buttons. Both signals must be displayed at stop before the operator can withdraw a clip-board, as both doors must be opened before a board



Southern Pacific Train Order Cabinet.

can be taken out. When the doors are open they prevent fastening the signals at clear by pushing rods *m* and *n* over the hooks by which the signal handles are held down. With any board out, it is impossible to close the circuit to either lock, and, therefore, the operator is unable to clear either signal until the boards are all restored to their places.

Having taken an order, the operator leaves it on the clip-board until the conductor comes in to affix his signature; and, with the board (and order) out of the cabinet, the operator may go about his other duties being assured that his signal is displayed at stop. Having delivered an order he restores the clip-board to the cabinet and closes the doors *c d*. Having closed these he has withdrawn rods *m n* so that either of the signal handles *e* or *f* may be hooked down, and therefore he can clear either signal.

The division between Russia and Japan on that part of the Chinese Eastern Railroad which extends from Charbin southward to Port Arthur is at the station Kuanchentsy, 148 miles south of Harbin, and 428 miles north of Port Arthur. The Japanese narrowed the gage on their part of the line, so that through trains are now impossible. Provision is made for tracks of both gages

for 20 miles south of Kuanchentsy to Changchun, where transfers from southbound trains will be made. Kuanchentsy is the transfer station for northbound traffic.

Accident Bulletin No. 26.

The Interstate Commerce Commission has issued Accident Bulletin No. 26, giving a summary in the usual form of the railroad accidents in the United States during the three months ending December 31, 1907. The number of persons killed in train accidents was 220 and of injured 4,187. Accidents of other kinds, including those sustained by employees while at work and by passengers in getting on or off cars, etc., bring the total number of casualties up to 20,458 (1,092 killed and 19,366 injured). These reports deal only with (*a*) passengers and (*b*) employees on duty.

TABLE NO. 1.—*Casualties to Persons.**

	Passengers		Employees		Tot'l persons reported	
	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd.	Inj'd.
Collisions	14	1,477	105	1,188	119	2,665
Derailments	7	629	71	519	78	1,148
Misc. accidents and boiler explosions	..	19	23	355	23	374
Total train accidents	21	2,125	199	2,062	220	4,187
Coupling or uncoupling	..	.....	77	945	77	945
Other work about trains or switches	..	.....	64	4,771	64	4,771
In contact, bridges, structures, etc.	..	5	26	422	26	427
Falling from or getting on cars or engs.	36	568	181	3,395	217	3,963
Other causes	24	626	464	4,447	488	5,073
Total, other than train accidents	60	1,199	812	13,980	872	15,179
Total all classes	81	3,324	1,011	16,042	1,092	19,366

*In Table No. 1 "passengers" includes passengers traveling on freight trains, postal clerks and express messengers, employees on Pullman cars, newsboys, live-stock tenders, men in charge of freight, etc.

This bulletin shows marked decreases in nearly every item of Table No. 1, reflecting the marked falling off in traffic which began last autumn on practically every railroad in the country. The largest proportional decrease, that in the number of passengers killed in train accidents, is in an item which is not so directly proportionate to the volume of traffic; this for reasons which have been noticed in previous bulletins; while the fatal accidents to passengers from other causes—largely from their own negligence or want of caution—have not decreased (60 now, 54 a year before). This probably indicates that the decrease in the total number of passengers traveling was not large; while, on the other hand, the diminution in the number or the severity of accidents affecting only trainmen undoubtedly is due, not alone to a falling off in traffic, but also to the diminished pressure under which the trainmen do their work. With the reduction in the volume of traffic there has been less of overwork and excessive hours, and also probably a weeding out of the less competent men.

The list of train accidents notable by their magnitude, heretofore of considerable length in each quarter, is now happily much reduced, the chief items in Table 2*a* being collisions 1, 9 and 11. Derailment No. 1, though comparatively of small magnitude, is noticeable as being one of a new class. It was a derailment of an electric car, running alone. Electric railroads doing interstate business have been so few that hitherto their reports have not been prominent in the accident records. Cars running alone are subject to accidents from defective brake apparatus which in trains of cars would not cause serious trouble.

In the amount of damage done to cars and engines there is no important decrease, as compared with the corresponding quarter in the preceding year.

TABLE 1*a*.—*Comparisons with Last Bulletin and with Same Quarter One Year Back.*

	Bulletins		
	No. 26.	No. 25.	No. 22.
Passengers killed in train accidents	21	110	180
Passengers killed, all causes	81	195	234
Employees killed in train accidents	199	236	294
Employees killed in coupling	77	87	84
Employees killed, all causes	1,011	1,144	1,196
Total passengers and employees killed, all causes	1,092	1,339	1,430

The total number of collisions and derailments was 3,964 as below:

TABLE NO. 2.—*Collisions and Derailments.*

	No.	Loss.	Killed.	Injured.
Collisions, rear	508	$472,847	39	705
" butting	264	474,144	46	1,051
" train separating	166	58,869	2	88
" miscellaneous	1,156	530,863	32	821
Total collisions	2,094	$1,536,723	119	2,665
Derailments due to:				
Defects of roadway, etc.	404	$243,272	10	299
Defects of equipment	819	650,538	9	224
Negligence of trainmen, signalmen, etc.	129	86,874	9	85
Unforeseen obstruction of track, etc.	84	92,720	17	169
Malicious obstruction of track, etc.	23	27,521	7	38
Miscellaneous causes	411	324,822	26	333
Total derailments	1,870	$1,425,747	78	1,148
Total collisions and derailments	3,964	$2,962,470	197	3,813

TABLE 2*a*.—*Causes of Forty-One Prominent Train Accidents (Class A).*

[NOTE.—R, stands for rear collision; B, butting collision; M, miscellaneous collisions; D, derailment; P, passenger train; F, freight and miscellaneous trains.]

			COLLISIONS.				
No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record.	Cause.
1	B.	P. & F.	5	0	$2,125	76	Passenger train ran over misplaced switch and into head of freight train standing on side track; dense fog; man in charge of switch in service only five days, but had been employed by this company two years before.
2	B.	P. & F.	0	18	2,215	46	Eastbound passenger collided with westbound standing freight; passenger ordered to run on westbound track; operator wrongfully reported freight had cleared that track. It was standing near his cabin, but he thought, or assumed, that it had passed.
3	R.	F. & F.	1	2	2,500	71	Engineman (killed) disregarded flag; had been on duty 28 hrs.
4	B.	F. & F.	2	4	2,500	81	Misplaced switch; misplaced by brakeman of seven months' experience; on duty 18 hrs. 30 mins.
5	R.	F. & F.	0	3	2,520	82	Failure to protect standing freight train by flag; conductor asleep in cab; flagman also in caboose; these men on duty 13 hrs. 57 mins; following train had been warned by two torpedoes.
6	R.	F. & F.	3	0	3,275	41	Freight standing at water station not protected by flag; 3 men in caboose killed.
7	R.	P. & P.	1	4	5,075	5	See note in text below.
8	B.	P. & F.	0	11	5,725	20	Conductor held order giving him until 6:15 to reach a certain station; took it for 6:50 and so told engineman; engineman did not read order; order not shown to fireman or brakeman.
9	R.	P. & P.	3	36	5,920	67	Three passengers killed; passenger train ran past automatic block signal indicating stop and struck passenger train standing at station. Engineman on duty 14 hrs. 20 mins.
10	B.	P. & F.	1	165	6,042	12	Conductor and engineman of empty engine overlooked schedule of regular passenger train; engineman's experience, 6 months. Engineman depended on conductor; conductor forgot.
11	R.	P. & P.	3	22	6,500	68	Three passengers killed; train in yard not protected by flag; other train approached at uncontrollable speed in dense fog.
12	B.	P. & P.	0	45	6,660	43	Misplaced switch; southbound train ran through cross-over in dark tunnel and engineman did not discover that he was on wrong track; switch not in working condition; had been spiked, but was loosened and turned by employee of contractor without authority.
13	M.	P. & F.	1	4	6,980	9	See note in text below.
14	B.	P. & F.	0	10	7,100	75	Order misread by engineman; conductor did not deliver order to engineman in person as required by rule.
15	B.	P. & F.	1	3	7,927	79	Freight had 1 hr. 10 min. on time of passenger train; conductor and engineman unaccountably calculated 2 hrs. 10 min., though they had read the order aloud.
16	M.	F. & F.	0	1	9,252	55	Cars ran out of siding at night; derailing switch 290 ft. from fouling point; cars had been left outside of derailing switch.
17	B.	P. & F.	2	11	9,900	45	Conductor and engineman of freight overlooked schedule of passenger train.
18	B.	F. & F.	3	2	10,150	7	Cars ran out of side track. Contrary to orders, cars had been left on unsuitable temporary track. Believed brakes had been maliciously loosened.
19	B.	F. & F.	1	1	10,170	13	Northbound train approached station at uncontrollable speed; engineman, experienced, did not manage air brakes properly.
20	B.	F. & F.	1	4	10,500	8	Southbound met one northbound train, but men forgot that order specified two trains. Conductor (10 years' experience as brakeman) was on his first trip as conductor.
21	B.	F. & F.	2	1	10,800	51	Operator neglected to deliver one of four orders. Conductor accepted other orders knowing his signature had been prematurely and wrongfully sent to despatcher. Operator in service at this place 12 days.
22	B.	P. & F.	3	53	12,400	16	Misplaced switch at meeting point; brakeman, 8 months' experience, on duty 20 hrs. 40 mins.; should have closed switch, and claims that he had done so.
23	B.	F. & F.	1	2	12,800	4	Disregard of distant and home signals approaching station (2 a.m.); engineman believed to have been asleep; brakeman in cab also probably asleep; fireman not well acquainted with road.
24	B.	P. & P.	1	10	13,650	42	Collision opposite station, both enginemen disobeying rule to approach under control. (See note in text below.)
25	R.	F. & F.	0	3	15,789	72	Standing freight not protected by flag; flagman's experience 1½ years; damage largely due to fire started from broken stove in caboose and from overturned engine.
26	B.	F. & F.	1	5	17,000	49	See note in text below.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record.	Cause.
27	M.	F. & F.	0	2	20,700	84	Westbound freight backed through cross-over into eastbound freight; brakeman, in service two months, set cross-over switch instead of side-track switch, as ordered.
28	B.	P. & F.	3	39	45,700	44	Conductor and engineman northbound freight encroached on time of regular southbound passenger train; men on duty 19 hrs. 52 mins. They knew that they were on the time of the passenger, detached engine and tried to reach station, evidently depending on possibility of passenger being a little behind time.
Total.....			38	457	$271,875		
					DERAILMENTS.		
1	D.	P.	1	35	$350	63	Excessive speed on curve due to broken brakebeam (electric car running alone).
2	D.	F.	0	3	2,700	29	Runaway on 2.2 per cent. descending grade; bad management of air; train pipe leaky; hand-brakes not promptly used. Engineman, on duty 28 hrs., did not seasonably signal to apply hand-brakes.
3	D.	P.	1	13	3,100	32	Accidental obstruction; wreck caused by derailment No. 10.
4	D.	F.	1	0	5,865	35	Excessive speed on curve and steep descending grade; engineman making his first trip on this branch; conductor applied air-brakes in caboose, but applied them too suddenly and broke coupling between engine and tender.
5	D.	P.	1	10	7,894	93	Two cars of passenger train blown off track by high wind.
6	D.	P.	0	3	10,287	97	Unknown.
7	D.	F.	0	2	10,400	95	Runaway on descending grade. (See note in text below.)
8	D.	F.	0	2	10,977	65	Mast of steam shovel struck overhead bridge, and bridge was weakened and fell. Height of shovel 19 ft. 6¾ in.; clearance at bridge had formerly been 19 ft. 7 in., but new and thicker ties had been put in, raising the rails.
9	D.	P.	1	12	11,100	57	Accidental obstruction; wreck of freight train on adjacent track derailed by shock due to automatic application of air-brakes. Triple valve on one car too sensitive.
10	D.	F.	0	0	13,210	31	Broken flange.
11	D.	F.	1	3	16,545	25	Unknown.
12	D.	F.	1	4	17,250	30	Runaway on descending grade; engineman in service on this steep grade two weeks; 7 years' experience elsewhere; had run four trips over this section as learner.
13	D.	F.	0	0	19,950	89	Broken flange.
Total.....			7	87	$129,628		
Grand total			45	544	$401,503		

Collision No. 7 was caused by an error of a signalman. The signalman at A allowed a passenger train to leave A for B before a preceding passenger train had reached B. This signalman is 25 years old, and has been employed in that capacity for five years. His explanation is that he was busy setting the switches and signals for switching movements which were going on at his station at the time when he was called upon to give the signal for the passenger train.

Collision No. 13 was at a crossing, a freight train of road A running into the side of a passenger train of road B. One sleeping car conductor was killed and four passengers were injured. The collision occurred at 5.45 a.m. The freight train approached the crossing at uncontrollable speed, either on account of the air pressure in the air-brake system having been excessively reduced, or by reason of defective judgment on the part of the engineman. This freight train had begun its trip without proper inspection, the air-brakes not having been tested; and besides this, the rule requiring 75 per cent. of the train to be air-braked had been disobeyed, only 22 cars out of 34 having their air-brakes connected to the engine. Road A asserts that the passenger train did not comply with the law requiring a full stop before passing over this crossing, and that if this stop had been made the collision would not have happened. The men in charge of the other train declare that they had made the stop. The conductor of the freight train had been on duty 21 hours and the engineman 13 hours; the experience of the conductor, as such, was five months, and of the engineman two years and four months.

Collision No. 24 was between a regular westbound and a regular eastbound passenger train, and it occurred exactly opposite a block-signal station. According to the rule, both trains should have approached the block-signal station with speed under such control that a stop could be made before reaching the signal in case it was not clear. It is stated in the report that the block signal was obscured by fog and also by smoke from an engine standing nearby on a side track.

Collision No. 26, a butting collision between freight trains at 9.36 p.m., and causing the death of a fireman, was due to the error of a telegraph operator, 19 years of age, who had been in the service of the road two months, though, according to the report, he had had four years' experience as an operator. An order having been sent to this operator for train No. 6 and it having become desirable to change this order, the despatcher asked the operator if the train had passed, and was told in reply that it had not, whereupon he sent an order restricting the right of train No. 6. It appears that when the despatcher asked his question the operator looked out of his window and saw the headlight of a locomotive and took it for train No. 6, but afterwards found that No. 6 had already passed and that the light was that of a switching engine. Train No. 6 had passed this station some minutes ahead of time, this having been authorized by the despatcher.

Derailment No. 7 was due to the mismanagement of the air-brakes, a heavy freight train becoming uncontrollable on a steep descending grade. The train had two engines. The leading engineman is held responsible, having neglected to use "straight air" to apply the brakes when he found the train was eluding control; and the engineman of the helping engine is held at fault for not having been watchful so as to take an opportunity to recharge the "train line" (air pipes and cylinders) and apply the brakes. The leading engineman had been in the service on this division only three months, but is reported as having had one year's experience elsewhere. He had been on duty 21 hours, with five hours' intermission. The other engineman had been on duty 17 hours, with five hours' intermission.

The bulletin contains the usual tables showing in detail the causes of injuries to employees in coupling and from falling off cars, etc.

The Exchange Settlement for Cars.*

BY J. R. CAVANAGH,
Superintendent of Freight Transportation, Cincinnati Northern.

We hear a lot of talk about returning cars to owners, etc. We might as well talk about insisting on the individual national bank notes being returned to each bank within a given time as to ever hope of having a practicable economical rule of returning to owning lines, the individual cars, except at an enormous expense of empty mileage and loss of traffic. As common carriers, we must furnish through cars to carry the traffic contracted for on through bills-of-ladings and under through published tariff rates.

Let us distinctly understand that every restriction on a car retards the accomplishing of the very purpose for which the car was built, namely, to take care of traffic offering from originating point to destination.

After long and careful investigation, I have concluded that the solution is a system of car hire and equalization on junction or exchange balances. There is no system that can be evolved that will not be met with some objections, but I believe that the junction exchange plan will reduce such objections to a minimum. I have considered several plans in place of per diem, such as percentage of all revenue obtained from freight charges, switching, demurrage and reclaims to be paid the car owners in place of per diem, thus making them to a certain extent participators in the revenue derived from use of the car, but such an arrangement would be almost as burdensome in accounting as the present per diem plan. Under the exchange plan we deal only with our immediate connections instead of three or four hundred car owners. We do away with a lot of three cornered fights on account of discrepancies at remote points, thousands of miles away from the car owner. By the 20th of each month all car service accounts for the previous month should be settled. No voluminous reports to several hundred car owners for per diem on cars used. No large force of clerks to check up the stack of per diem reports received from several hundred roads, endless correspondence in regard to discrepancies, thousands of dollars outstanding unsettled account of the individual items too small to arbitrate, expense of errors in figuring and checking per diem, or elaborate expenses of postage and stationery.

The present interchange reports as adopted by the American Railway Association with slight modification and providing additional space as submitted herewith will cover the requirements.

Dr. or Cr.	Balance from last report	_____
	Delivered this date	_____
	Received this date	_____
Dr. or Cr.	Balance this date	_____

Both agents have their copy and certify. The delivering line must pay the car balance rate until it has cleared the car. In cases of omissions, should recommend the use of a consecutively numbered credit slip to be taken into account in the current day's report. Under the proposed exchange settlement plan we can report and settle on a car basis, a ton capacity or both. We can, if deemed practicable, make a different rate for each class of car without materially increasing the accounting. The rates may be changed from time to time to meet the existing or temporary conditions, without disturbing the method of accounting as it would be simply changing the rate that the balance is multiplied by. Under this plan we exchange our cars under rules that may be agreed upon. This scheme also prevents any industrial or other road building

*From an address before the Central & Western Association of Car Service Officers.

a large equipment and forcing it with their own loading on connections, as they must take an equal number of cars in exchange if offered.

I do not suppose that this plan will insure absolute equalization, but I do think it will come nearer doing it than any other plan yet devised. Under the exchange plan, if a connection persists in not equalizing or in reducing the balance there are several remedies that can be applied, such as the stopping of loading *via* such a line, or, if deemed practicable, the application of a penalty in the nature of an advance rate after a given time, which would not affect any other road or territory.

The Minneapolis Freight Station of the Wisconsin Central.

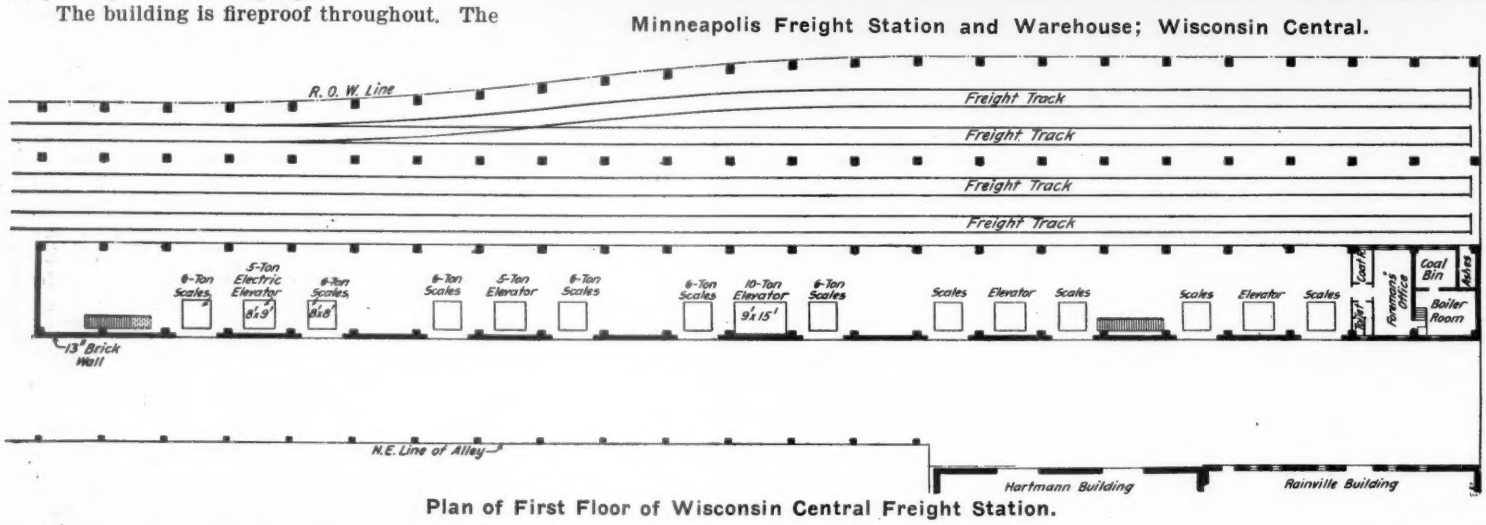
The Wisconsin Central recently completed in Minneapolis, Minn., a fireproof freight station and storage warehouse to replace the one which was destroyed by fire in April, 1907. The building is at Hennepin avenue and Bridge square, in the heart of the wholesale district. It is 417 ft. long, 79 ft. 7 in. wide on Hennepin avenue, 66 ft. 1 in. wide at the rear, and is four stories high. Two photographic views of the station are shown herewith. From the rear view and the cross-section it will be observed that the tracks are below the street grade, which leaves 18 ft. clear headroom under the second-story floor beams. The freight is worked in this sub-story on a platform 24 ft. wide and 415 ft. long, and is hoisted to the storage floors by five electric elevators. Four of these are of 5 tons and one of 10 tons' capacity. Scales are located in front of every door on this floor. On the other side of this platform or sub-floor is a sub-street for incoming freight. Above this is a 34-ft. roadway from Hennepin avenue to First avenue north, which is intended primarily for transfer and storage vehicles. The front part of the second story, which is only a little above the street level, contains the offices and vaults, and the remainder of this floor and the two floors above are for storage, there being about 100,000 sq. ft. for this purpose.

The building is fireproof throughout. The floor system and supports are reinforced concrete on the Turner system, the walls are hard brick, the roof solid concrete slabs, and the windows have metal sash and wire glass. The elevator shafts and the stairways are incased in tile, with fireproof doors. All openings for loading have rolling steel doors.

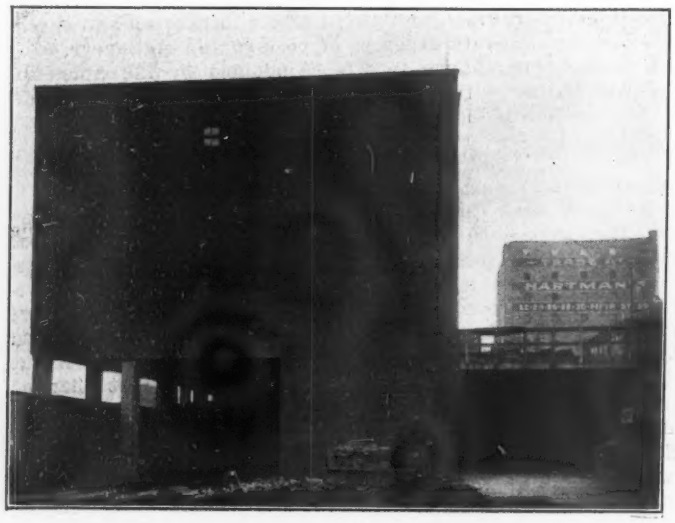
The footings of the building are on solid limestone ledge. The columns in the sub-story are 26 in. square, reinforced with eight vertical rods, banded together with bar hoops, at intervals. In the three upper stories the columns are round, 24 in. in diameter. The beam connection to these round columns was made without great difficulty. A beam ceiling was used, except under the 34-ft. driveway from Hennepin avenue. The maximum clear span is 26 ft. The reinforcement in the beams was well lapped at the continuous end to provide for maximum moment at that point, and bent suitably to provide for shear. Wire net wrapping was used in the beams. The maximum panel is 18 ft. x 26 ft.

The first, second and third floors were designed to carry a working load of 350 lbs. The floor slab was reinforced two ways, the

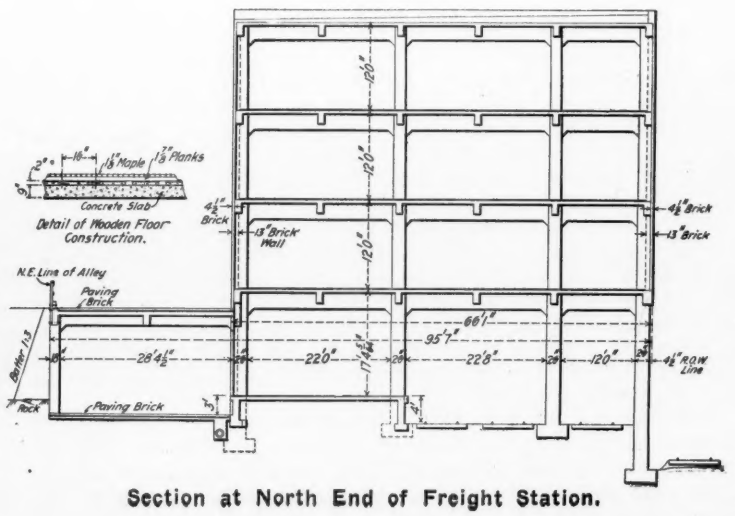
Minneapolis Freight Station and Warehouse; Wisconsin Central.



Plan of First Floor of Wisconsin Central Freight Station.



End View of Wisconsin Central Freight Station.



Section at North End of Freight Station.

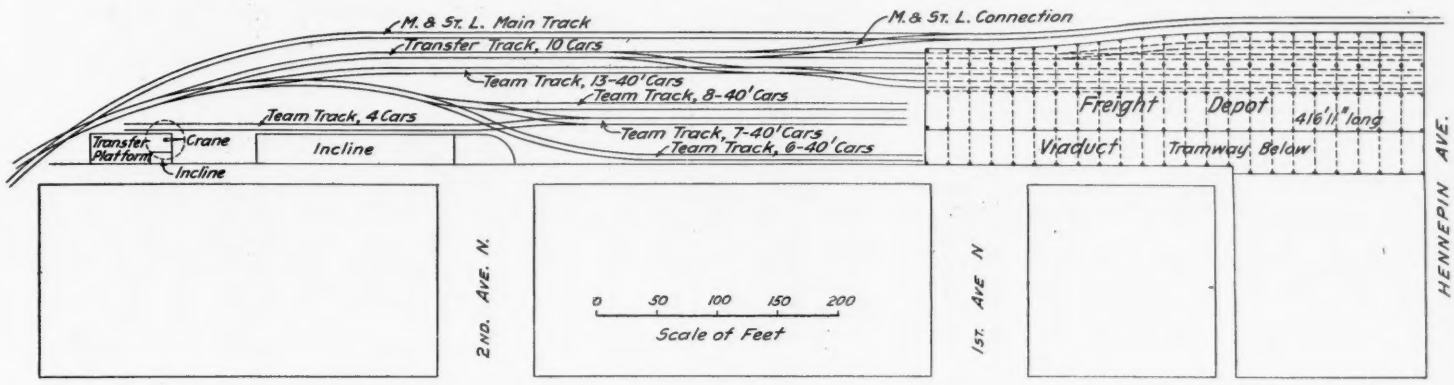
panel being subdivided by a secondary beam running from girder to girder. Nailing strips were laid on the slab with a filling between, 2-in. rough pine over this, and on the top a 1¾-in. maple floor.

The concrete was mixed in the sub-story at the level of the tracks by a "Cube" mixer, was raised to the floors by a Ransome hoist and placed by dump cars running on a narrow-gage railway. The concrete was a fairly rich gravel mixture, mixed wet.

The slab for the driveway is the Turner "mushroom" system. There are no beams, and the flat ceiling thus secured allows a good distribution of light, and accomplishes a very necessary object—the saving of headroom in the sub-story. This slab is 11½ in. thick and spans 30 ft. It is reinforced in four directions, directly and diagonally from column to column. A great many advantages are claimed for this system in the matter of speed of construction and cost. The centering for the slabs in this, as well as the beam construction, was corrugated iron. It was quickly placed and struck without material damage to the iron.

The need of erecting the building as quickly as possible afforded a comparison of some of the advantages of reinforced concrete over steel construction. Sketches were made and the steel order placed in a day's time. The building was erected complete in practically three months, or in the time ordinarily necessary to get structural steel on the ground. Shop details for such a structure of steel would take considerable time to get out, owing to the curved side of the building, where no two beams are of the same length. The reinforced concrete skeleton was pushed ahead in advance of the walls, which saved time and provided a floor for the masons, facilitating the laying of the curtain walls.

The design and erection of the building were under the supervision of C. N. Kalk, Chief Engineer of the Wisconsin Central. The reinforced concrete was designed by C. A. P. Turner, Consulting Engineer, Minneapolis. Butler Bros., St. Paul, were the contractors.



Proposed Reconstruction of Hennepin Avenue Yard; Wisconsin Central.

Rebates and the Steel Industry.*

On completion of the Erie, New York Central, Baltimore & Ohio, and the Pennsylvania systems between the Atlantic seaboard and the great West, a strong competition for through traffic at once began. At first it was a scramble, and each road got what it could, at the best rate it could, regardless of everything. The position was peculiar, and is so still, and must long remain so.

Matters went along tolerably well until railroad rates were thoroughly demoralized by war between the trunk lines. Our Carnegie Steel Company, upon this occasion, had had what it thought the certainty of a contract of great value for material with the Newport News Shipbuilding Company, freight from Pittsburgh to Newport News being much less than from Chicago. The contract went to Chicago, and upon investigation we found that the rate given to our Chicago competitor to Newport News was less than the Pennsylvania Railroad rate from Pittsburgh, the distance not one-half so great. President Ingalls of the Chesapeake & Ohio, then beginning his brilliant career, had made the low rate for his new line not yet embraced in the "gentlemen's agreement." We investigated, and found several rates of a similar nature prevailing to other points, and having a list of these made, the writer carried it to President Roberts of the Pennsylvania Railroad, with a request that he place us upon his own line on an equality with manufacturers on other lines. When the paper was presented to him, showing the overcharges we labored under, he pushed it aside, saying: "I have enough business of my own to attend to; don't wish to have anything to do with yours, Andy." I said: "All right, Mr. Roberts; when you wish to see me again, you will ask an interview. Good morning."

The situation had become intolerable, and we looked about for the best means of protecting ourselves. A railroad line of our own from Pittsburgh to the Lakes would be an invaluable acquisition. I purchased the harbor at Conneaut and a few miles of railroad connected with it, and began extending the line to Pittsburgh. I took good care that the authorities in Philadelphia were advised of the policy I had determined to pursue if there was the slightest interruption to our business. It was not long before I received a note from Vice-President Thomson, saying that President Roberts and himself would like an interview. I agreed to call as I passed through Philadelphia, and did so. My partners did not see their way to fight the great Pennsylvania Railroad; but my Scotch blood was up, and I was in to fight to the death. What I needed for the interview with my former railroad associates were the secret rebate rates prevailing elsewhere. Our freight agent, Mr. McCague, a clever young man, obtained these and placed them in my hands in a few days.

Entering President Roberts' room, I found him and my dear friend, Frank Thomson, vice-president, sitting together. My reception was cordial. "How are you, Andy?" "How are you, Mr. Roberts? How are you, Frank? Gentlemen, you asked me for an interview, and here is the culprit before you. Put me in the dock and question me as you wish." Frank said: "This is just what we want to do. May I be examiner?" "Yes," I said, "you are just the man." "What are you fighting the Pennsylvania Railroad for?" he asked. "You were brought up in its service. We were boys together." "Well, Frank, I knew you would ask me that question, and here is the answer." I handed him the packet of secret rates, and, begging to be excused for a few minutes, left the room, desirous of giving them an opportunity of looking it over together. Upon my return they were still sitting with the packet lying before them. Frank raised his head and exclaimed: "Andy, I feel like Rip Van Winkle." "Frank, the Pennsylvania Railroad officials have slept just about as long." "Well, tell us what you want." "I don't want anything. I did not ask to see you. You asked to see me." "Don't talk that way. What do you want? We wish to make an arrangement satisfactory to you. We did not know these things were going on. We can hardly believe it; but we shall now find out. Tell us what you think we ought to do."

I said: "Gentlemen, all that we have ever asked was that the rates charged us shall be at all times as low as those which competitors on other lines are paying on the same articles for similar distances. We ask for nothing else. Other lines are carrying freight for our competitors cheaper than you are carrying it for us, and you take part of this freight at the cut rates. We cannot stand that. We have never asked for lower rates than our competitors, but we shall never rest satisfied with less." "If you will stop building that line from the Lakes to your works, we will do what you ask," was his response. "Gentlemen, that cannot be. I have agreed to build that line, and certain parties have taken action in consequence of my promise. It has to be built." The result of the meeting was that I got all I asked for, and greatly obliged the Pennsylvania Railroad by allowing them to retain transportation of our own coke traffic from the coke fields to Pittsburgh. Everything was satisfactorily arranged, and we were all "boys together" again. I was the ally of the Pennsylvania Railroad, much to my delight. It was estimated that the agreement saved us about one and a half millions of dollars per year.

Some time after that, when war again broke out between the rival systems, the late William H. Vanderbilt asked me what I thought of the project of his son-in-law, Mr. Twombly, to extend the Reading system to Pittsburgh, through Pennsylvania. I said: "If you will undertake it, I and my friends will go with you to the extent of $5,000,000," a prodigious sum then—at least to us. "If you will, then I will put in $5,000,000 also," he replied. Thus the South Pennsylvania was organized, and its construction begun. Here was a chance for the New York Central to grip and hold its antagonist by the throat; but the Pennsylvania interests, seeing

*From a paper by Andrew Carnegie in the *Century Magazine*.

what the movement involved, approached Mr. Vanderbilt while I was in Europe and induced him to surrender. Exactly what advantage the New York Central system received I do not know, but it should have been great indeed; for this was probably the greatest mistake in its history. The key to masterdom for the Vanderbilt interests was foolishly thrown away.

My personal effort to build the Bessemer Railroad to the Lakes came after these vain efforts of united Pittsburgh to emancipate herself. When Mr. Cassatt ended the agreement entered into between his predecessor and myself, I was quite prepared to take up the challenge. We were once more free. I called upon George Gould and said to him: "Years ago your father approached me and said he would buy the control of the Pennsylvania Railroad, and divide profits equally with me, if I would promise to devote myself to its management. My heart was in steel development, and I declined. This morning I come to you and offer an opportunity to create and control a through line from the Atlantic to the Pacific. Extend your line to Pittsburgh, and we will give you a contract for one-third of all our business, provided you agree to give us the rates prevailing elsewhere and enjoyed by our competitors." I offered to build west to meet him, and also to join him in building east. Fortunately he agreed, and the result is that the Gould system to-day is in Pittsburgh, enjoying that contract. We were just on the eve of arranging to extend the line eastward, taking in our coke works en route, which would have been a hard blow to the Pennsylvania Railroad, since we controlled our own coke traffic, when Mr. Morgan asked Mr. Schwab if I wished to retire from business; if so, he thought he could let me out. I replied in the affirmative. Of course we stopped all negotiations looking to eastern extension after this, and the result was my retirement from business.

Rail Section Tracing Machine.

At a recent meeting of the Institution of Civil Engineers (England), H. E. D. Walker gave a description of a rail section tracing machine that he had designed for obtaining a drawing of worn or new rail sections that would be accurate and reliable.

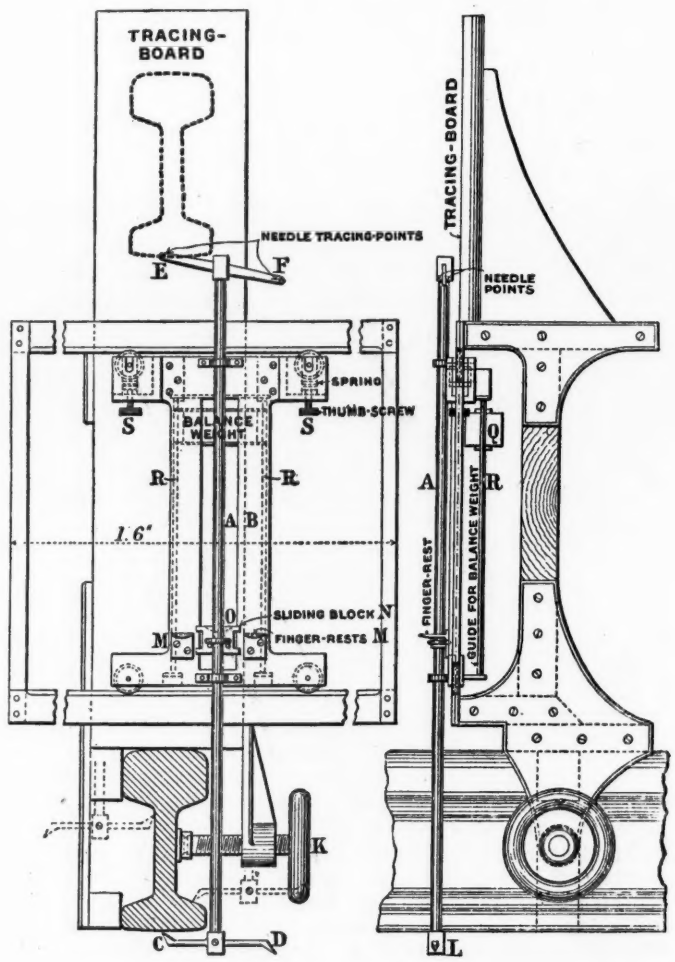
The machine consists of a rod A, having a free vertical and axial motion, and held by a carrier B, having a free horizontal motion. The bottom of the rod is fitted with a sharp pointed bent steel cross arm, C D; one of the sharp points (C) is bent upwards, and the other (D) downwards, so as to be able to follow the lower and the upper curves of the rail-section respectively. The top of the rod has a cross arm E F, fitted with two hardened needle-points at each end, which, when in contact with the paper affixed to the tracing-board, are adjusted to correspond with the position of their respective tracing-points below. This adjustment requires the lengths of the upper and lower tracing-arms to be different, as shown in the engraving, and the correct position is indicated by the line *hg*, being at right angles to the tracing-board and to the rail section to be taken. The sliding-block N, in which the boss O of the tracing-rod can freely turn, is attached by a string, passing over a pulley to the metal box Q, placed between the guide-rods R R. The box Q is filled with lead to balance the weight of the tracing-rod and of the arms, thus relieving the operator, in his necessarily cramped position, from the small but inconvenient weight of the tracing-rod. The horizontal motion of the carrier is steadied by fitting the upper wheels to a sliding axle-box, backed by springs, the pressure of which may be regulated by the milled head-screws S S.

The first step is to oil thoroughly around the rail where the section is to be obtained, so that the steel point may pass easily along the roughened surface of the worn metal. The machine is then clamped firmly to the rail by the wheel-screw K. The paper having been fixed on to the tracing-board by drawing pins, the operator, sitting across the rail and facing the front of the machine, takes hold of the boss L at the bottom of the tracing-rod with the right finger and thumb and guides the pointer (C) across the under surfaces of the rail, at the same time placing two fingers of the left hand on the finger rests M to assist and steady the horizontal motion of the carriage. With this pointer he follows both the lower curved surfaces and the web on one side of the rail. Then, by running the carrier to the end of its path, he can turn the rod round on its axis, as it is then clear of the tracing-board, so that the downward bent pointer (D) can be made to follow all the upper curves on that side of the rail, and join up to the line already made for the vertical side of the web as indicated by lighter and darker dotted lines of the rail tracing in the front elevation. By allowing the rod to rise to its highest position the carriage can be passed across to the other side of the rail, which can then be traced, thus completing a perfect diagram of the rail section. The whole operation can be performed in from three to four minutes.

The paper is then taken off the board, and the section traced in the office, and by being placed within the lines of the original section or previously obtained diagram, the position and quantity of the worn portion is immediately seen; the area can be obtained by a planimeter. The rate of wear can be valued from the time elapsed since the preceding operation, and the modulus of section can also be calculated.

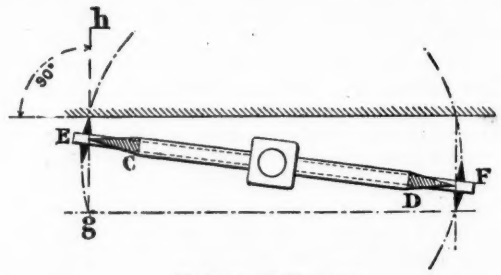
The author suggests, in order to obtain satisfactory data for determining the time for the renewal of any portion of a line, that the above operation should be repeated at two-year intervals, at exactly the same position, on a typical rail fairly representing the conditions of situation, curve and gradient of each length relaid.

As it is essential that the needle-points of the tracer E F should



Rail Section Tracing Machine.

not become worn, the author experimented with various surfaces on which to make the tracing, and finally adopted a strong smooth drawing paper which he covered with a very thin layer of melted white wax mixed with lamp-black. A black surface was obtained which the needle-point easily and smoothly cut through, and the section of the rail thus appeared as a thin white line on a black ground. This proved quite satisfactory, as it prevented any scratch-



Detail of Tracer.

ing or tearing of the paper surface, and the section was afterwards easily traced.

Such an apparatus as this offers the only really satisfactory method that there is of obtaining a correct cross section of a rail, and if this information is obtained at regular intervals it will not only provide the desired data as to the strength of the rail from time to time, but will also afford a reliable guide as to the position and the rate of the wasting in progress, by means of which the exact time may be determined when its renewal will be necessary, provided the conditions of service remain comparatively constant. As the rate of deterioration may vary considerably on even a short length of railroad, it is worth while logging the information obtained in the form of a continuous record.

The Thames Tunnel.

The old "traffic tunnel" under the Thames, in London, was designed by Brunel in 1823, and took upwards of 17 years to build, including a lapse of seven years when no progress was made. Through the courtesy of the Pennsylvania Railroad we are enabled to reproduce a pamphlet published in 1840, describing this work, together with the original illustrations. It will be observed that the fundamentals of the modern tunnel shield are all there except the tail tube, which only came into use when tunnels were given a perfectly circular form. The pamphlet, slightly excerpted, follows:

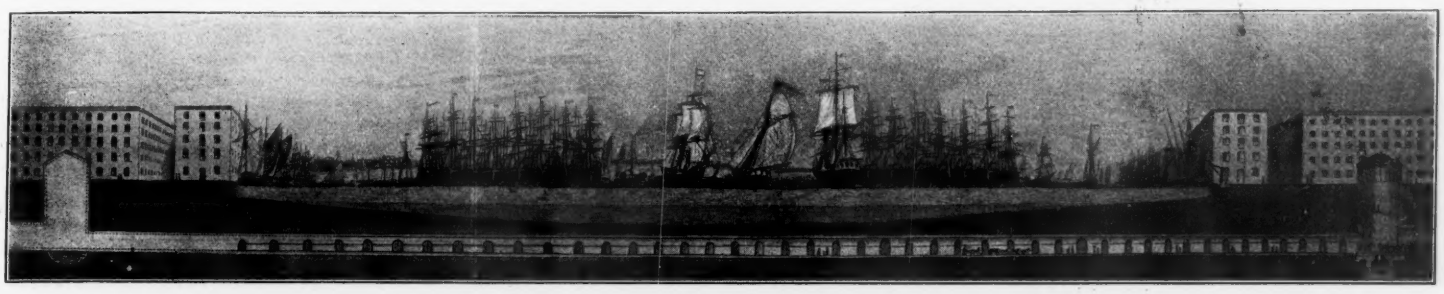
The constant inquiry for information relating to the construction of the tunnel under the Thames has induced the directors to publish the following account of the origin and progress of the work.

An acquaintance with the immense and various mercantile concerns carried on in the vicinity of London Bridge, and immediately in the neighborhood of the tunnel, will show the obvious utility, and the consequent importance, of a convenient communication by land from shore to shore at that part of the river Thames; and it appears from the number and magnitude of the shipping constantly passing, that the only plan which could be resorted to with a necessary regard to economy, and which should be free from objections on the ground of injury or inconvenience in the navigation of the river, is that of a tunnel under the bed of the river, of sufficient capacity to accommodate the local traffic.

The project of a tunnel at Gravesend was put forward in 1799, but the scheme was soon abandoned; this was followed by an attempt to form a tunnel from Rotherhithe to Limehouse in 1804, are now only adverted to, to show the interest and importance attached to such an undertaking.

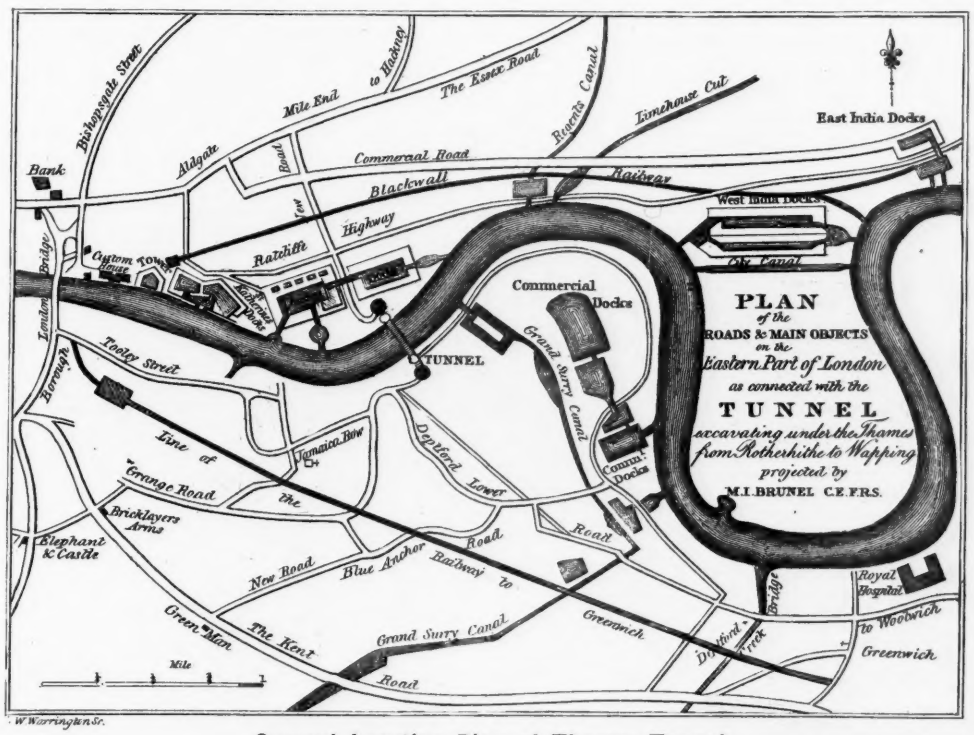
Mr. Brunel, in 1823, proposed and exhibited his plan for constructing at once, and on a useful scale, a double and capacious roadway under the Thames, which was not only well received, but liberally supported by many gentlemen of rank and science, who were not discouraged by the extraordinary risks which an enterprise of such magnitude must encounter; and no one has given it more prominent and consistent support, under all its vicissitudes, than the Duke of Wellington. His Grace described it as "a work important in a commercial as well as in a military and political point of view."

The spot between Rotherhithe and Wapping, selected for the intended communication, is perhaps the only one situated between London Bridge and Greenwich, where such a roadway could be attempted without interfering essentially with some of the great mercantile establishments on both sides of the river. It is about two miles below London Bridge, in a very populous and highly commercial neighborhood, and where a facility of land communication between the two shores is very desirable, and will prove to be of very great advantage, not only to the immediate neighborhood, but also to the neighboring counties.



Cross Section of River and River Bed.

While the necessary steps were taking to obtain an Act of Parliament, and to raise money to carry the plan into effect, the committee of subscribers employed competent persons, unconnected with the engineer, to make borings across the river in the direction of the future work, in three parallel lines. On the 4th of April, 1824, they reported most favorably on the projected enterprise, upon which Mr. Brunel was induced to enlarge the dimensions of his original plan, and consequently the apparatus by which he intended to secure the excavation, while the brick-work was in execution.



General Location Plan of Thames Tunnel.

An act of Parliament having been obtained on the 24th day of June, 1824, and Mr. Brunel appointed the engineer to the undertaking, he began his operation by making preparation for a shaft of 50 ft. in diameter, which he commenced at 150 ft. from the river on the Rotherhithe side. This is effected by erecting a substantial cylinder of brick-work of that diameter 42 ft. in height, and 3 ft. in thickness, which was sunk *en masse* into the ground.

Upon the top of the cylinder was placed a steam engine for the pumping out of the water and for the purpose of raising the excavated earth. By this means Mr. Brunel succeeded in forcing the cylinder through a bed of gravel and sand 26 ft. deep, full of land-water, constituting, in fact, a quicksand in which the drift makers formerly had been compelled, as well to suspend their work, as to reduce the dimensions of their shaft from 11 to 8 ft.

While this operation was in progress, Mr. Brunel received an intimation from eminent geologists apprising him of the existence of a bed of sand lying at a greater depth, and advising him to go as little as possible below the bed of the river. This information corresponded with the account given before by the drift makers respecting the existence of a quicksand, and its depths beneath the level of high water.

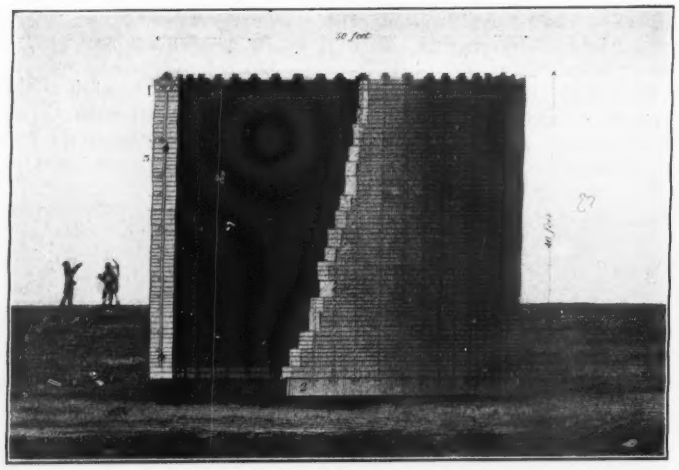
The shaft having been sunk to the depth of 65 ft., another smaller shaft 25 ft. in diameter, destined to be a well or reservoir for the drainage of water, was also sunk from this lower level; but, at a depth of about 80 ft. the ground suddenly gave way, and sunk several feet at once, sand and water blowing up at the same time. Thus was the previous intelligence confirmed of the existence and the nature of the bed of sand in question, and which governed the engineer in the level he had proposed originally to take for his horizontal structure.

under the authority of an Act of Parliament. A shaft of 11 ft. in diameter was sunk to the depth of 42 ft., with a view to the commencement of the horizontal excavation, when from difficulties which were encountered it was for a time suspended. It was afterwards continued at a reduced diameter of 8 ft. to the depth of 76 ft., at which depth a small driftway was carried therefrom under the river to the extent of 923 ft., and to within 150 ft. of the opposite shore, when new difficulties having arisen, the engineer reported that any further progress was impracticable, and the work was abandoned.

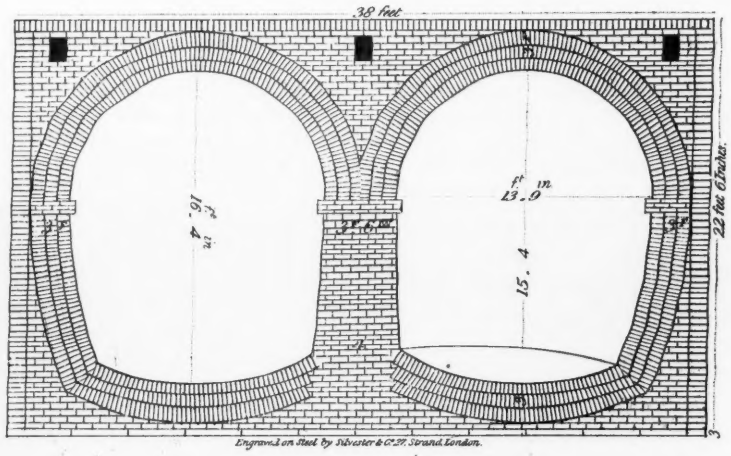
Various plans were, from time to time, proposed for the construction of a tunnel, none of which came to maturity; and they

The shaft and reservoir having been completed, the excavation for the body of the tunnel was commenced at the depth of 63 ft.; and in order to have sufficient thickness of ground to pass safely under the deep part of the river, the excavation was carried on at a declivity of 2 ft. 3 in. per hundred feet.

The excavation which has been made for the Thames tunnel is 38 ft. wide, and 22 ft. 6 in. high, presenting a sectional area of



The Shaft.



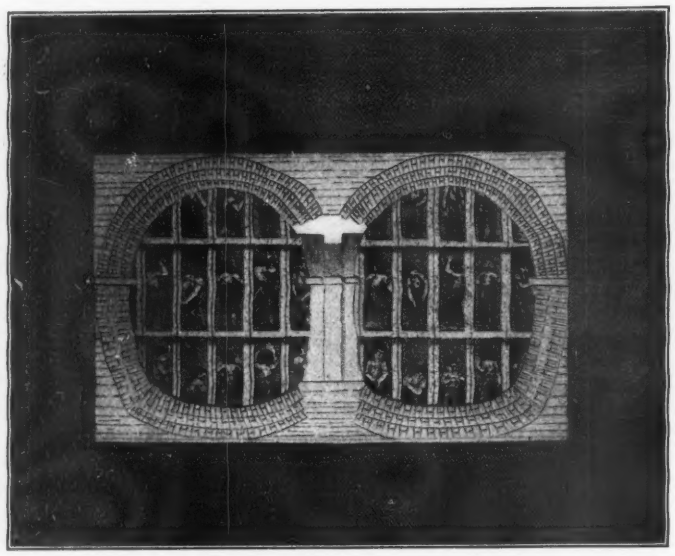
Cross Section of Tunnels.

850 ft., and exceeding 60 times the area of the drift which was attempted before.

The base of this excavation, in the deepest part of the river, is 76 ft. below high water mark.

It is by means of a powerful apparatus of iron, which has been designated a shield, that this extensive excavation has been effected, and that the double roadway and foot-paths, which now extend to within a few yards of the wharf at Wapping, have at the same time been constructed. This shield consists of 12 great frames lying close to each other, like so many volumes on the shelf of a bookcase; these frames are 22 ft. high and about 3 ft. wide. They are each divided into three stages or stories, thus presenting 36 chambers, or cells, for the workmen—namely, the miners, by whom the ground is cut down and secured in front, and the brick-layers, by whom the structure is simultaneously formed, and which serves also as a scaffolding for them.

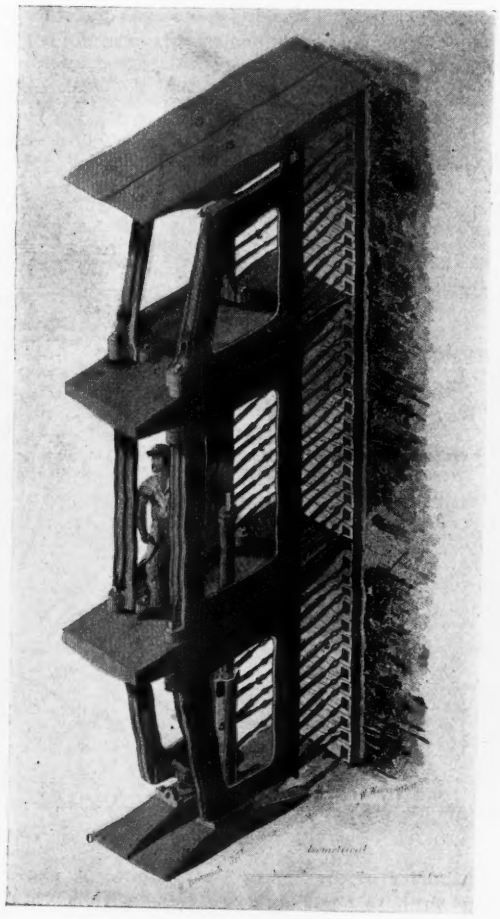
Powerful and efficient as this apparatus has proved to be in accomplishing the work, the greater part of which is now happily completed, the influence of the tide upon some portion of the strata beneath the bed of the river, greatly contributed to increase the labor, and to multiply the difficulties, and materially to add to the danger attending the excavation. That influence upon some of the strata, or upon some portions of the strata, was not noticed by the drift makers previously; owing, most probably, to the circumstance that more than nine-tenths of their excavation had been carried on under a bed of rock, and the comparatively small dimensions of the work in question.



Working Inside the Shield.

The shield was placed in its first position at the bottom of the shaft by the first of January, 1826, and the structure of the double archway of the tunnel was commenced under a bed of clay; but on the 25th of the same month the stratum of clay was discovered to break off abruptly, leaving the shield for upwards of six weeks open to a considerable influx of land water, which flowed copiously from a bed of sand and gravel, which was saturated anew at each rise of the tide. The progress of the work was in consequence much impeded.

On the 11th of March this fault or break in the clay being passed, and the shield again under a bed of clay, the work proceeded, and on the 13th of June, 1826, was advanced under the bed of the river, increasing daily in its progress. By the 13th of April, 1827, the tunnel had extended 400 ft. under the river; these 400 ft. of the tunnel were excavated, and the double archways substantially completed with brick-work in ten months and a half. On the 18th of May, 1827, and again in the month of January, 1828, the river broke in, and filled the tunnel; thereby occasioning the apprehension that this unprecedented undertaking, which had excited so much interest, not only in England, but throughout Europe, might be abandoned. After, however, filling

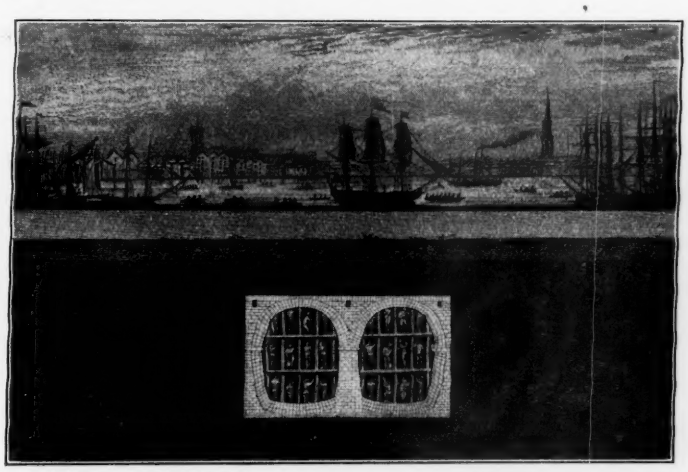


Frame of Shield.

the chasms in the bed of the river with bags of clay, and clearing the tunnel of water, upon re-entering it, the structure was found in a perfectly sound and satisfactory state; and the strongest proof is afforded of the efficiency of Mr. Brunel's system of constantly protecting as much as possible every part of the soil during the excavation; and finishing the structure in the most solid manner as the work proceeded, by the instrumentality wholly of the shield.

Subsequent to these eruptions of the river, such was the desire

to see the work completed that several hundred plans were communicated to the directors and engineer for filling up the cavity, as well as for the prevention of future accidents. All the plans were duly examined, and attentively considered; and the board of directors expressed, under date of the 16th of December, 1828, their obligations to the many scientific men who had so spontaneously communicated their several ingenious suggestions for securing and completing the undertaking.



View of Wapping, With Cross Section of Tunnels.

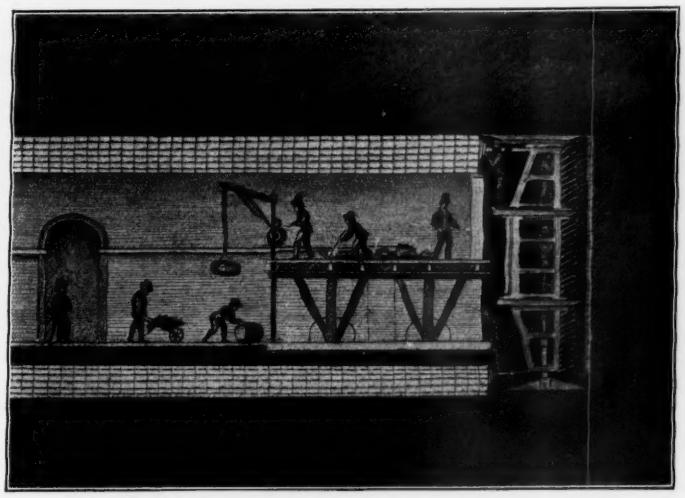
The works from that time remained suspended during a period of seven years, when they were re-commenced, and have been steadily and successfully continued to the present time.

To facilitate the access to the tunnel for the large population in its immediate neighborhood, it is intended to make the carriage way descents circular, and they will not exceed in any part the slope of Ludgate Hill, or Waterloo place, Pall Mall. The shaft, from whence the tunnel works are now carried on, was built at Rotherhithe in the form of a tower, 50 ft. in diameter, 42 ft. high and 3 ft. thick, at about 150 ft. from the edge of the wharf, and it was sunk into its position by excavating the earth within. In the annexed sketch the brick-work is supposed to be broken open, to show its construction, and the numbers below refer to the different parts of that "tower," which now forms the foot passenger's shaft, and is intended finally to be occupied by an easy double flight of steps, for the use of passengers going through the tunnel.

1, 1.—The wooden rings, or flat curbs.
2.—The iron curb.
3.—Hoops, or laths, binding together the uprights.
4, 4.—Iron rods enclosed in wood } Screwed tight to the top and the bot-
5, 5.—Wooden road . . . . . } tom curb.

A transverse section of the tunnel is here given, showing the dimensions of the mass of brickwork, which is all firmly set in Roman cement.

It must be observed that the middle wall is, for greater security while in progress, built quite solid; but for convenience, light and general effect, a succession of arches are subsequently opened in



Longitudinal Section of Tunnel.

that middle wall, so as to admit of frequent communications between two carriage ways.

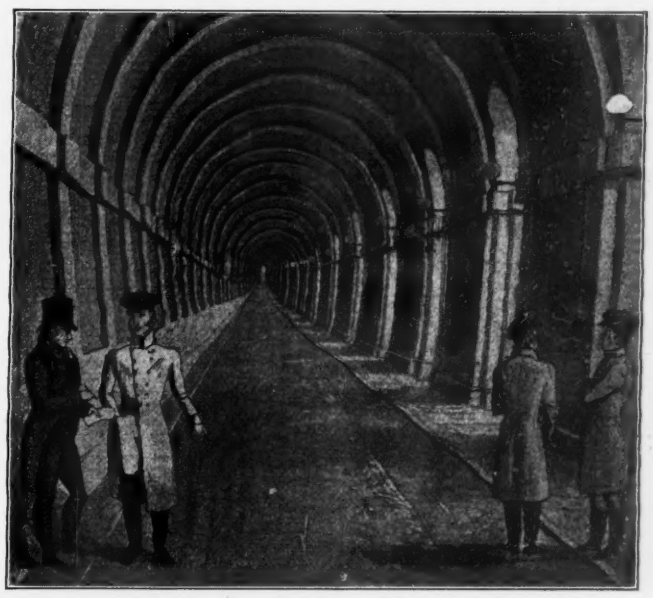
The dimensions of the excavation under the river are 28 ft. wide by 22 ft. 6 in. high; the whole area of which is constantly covered and supported by the shield in 12 divisions, which are advanced alternately and independently of each other; they have each three floors, or stages, forming a succession of scaffolding and cells for the bricklayers and mines during their operations.

A longitudinal section of about 40 ft. of the tunnel, with a side view of the shield, and the miners as well as the bricklayers at work. This sketch represents also the moving stage, with two floors, used by the miners to throw thereon, for removal, the earth they excavate; and where the bricks, cement and other materials are placed in readiness for the bricklayers. Towards the head and foot of the shield is also shown the position the horizontal screws, a pair of which being attached to each of the divisions, and turned so as to press against the brick-work, are used to propel each division forward.

The divisions of the shield are advanced separately and independently of each other, by the means pointed out in the foregoing sketch; each division, as is attempted to be shown in the annexed design, has boards in front (known by the technical name of poling boards) supported and kept in position by means of jack screws, which are lodged against the front of the iron frame; these boards are in succession taken down while the earth in front of each is excavated, the board being always replaced before a second is removed; thus forming a constant firm buttress. The several parts will be better understood by reference to the following numbers:

1. Poling boards.
2. Jack screws.
3. The "top staves" covering the upper part of the excavation, till the shield is succeeded by brickwork.
4. Screws to raise or depress the top staves.
5. "The legs," being jack screws fixed by ball joints to the shoes.
6. "The shoes" upon which the whole division stands.
7 and 8. The sockets where the top and bottom horizontal screws are fixed to force the division forward.

The opposite transverse section of the river Thames, with a longitudinal section of the tunnel beneath it, shows the progress of the work, which is now completed (1840) to the extent of 1,135 ft.



Western Archway of Tunnel, Lighted by Gas.

from the foot passengers' shaft at Rotherhithe towards Wapping, with the openings provided to afford free communications from one archway to the other.—*Thames Tunnel Office, Walbrook Buildings, Walbrook, 1st September, 1840.*

The Municipality and Public Utilities.

City Operation.

Methods embarrassed by law.
Methods antiquated.
Methods non-direct; to increase the importance of officials.
Appointments of head men made as rewards for political service.
Appointments and dismissals of subordinates hampered by the civil service laws and by the exigencies of politics.
Many unnecessary or inefficient men carried on the pay-roll for political reasons.
Appropriations granted or withheld, largely for political reasons.
In many cases, 50 per cent. of a day's work accepted for a day's pay.
Honesty, sobriety, loyalty, willingness, energy, courtesy, and tact command no better rating than the opposite qualities—the civil service certification of competency levels all.

Corporation Operation.

Methods chosen by the head men of the corporation.
Methods kept up to date.
Methods direct; to make the minimum amount of work.
Appointments of head men made for fitness.
Appointments and dismissals of subordinates at the will of their immediate superiors, who are responsible for results.

A few unnecessary or inefficient men carried on the pay-roll for political reasons.

Appropriations granted or withheld in accordance with sound business reasons.

Generally 100 per cent. of a day's work demanded for a day's pay.

Honesty, sobriety, loyalty, willingness, energy, courtesy and tact command corresponding rewards in the shape of increases of salary, or promotion; or in the shape of a reputation which will attract the attention of other and more liberal employers.—*H. S. Wynkoop.*

Reinforced Concrete Overgrade Highway Crossings.

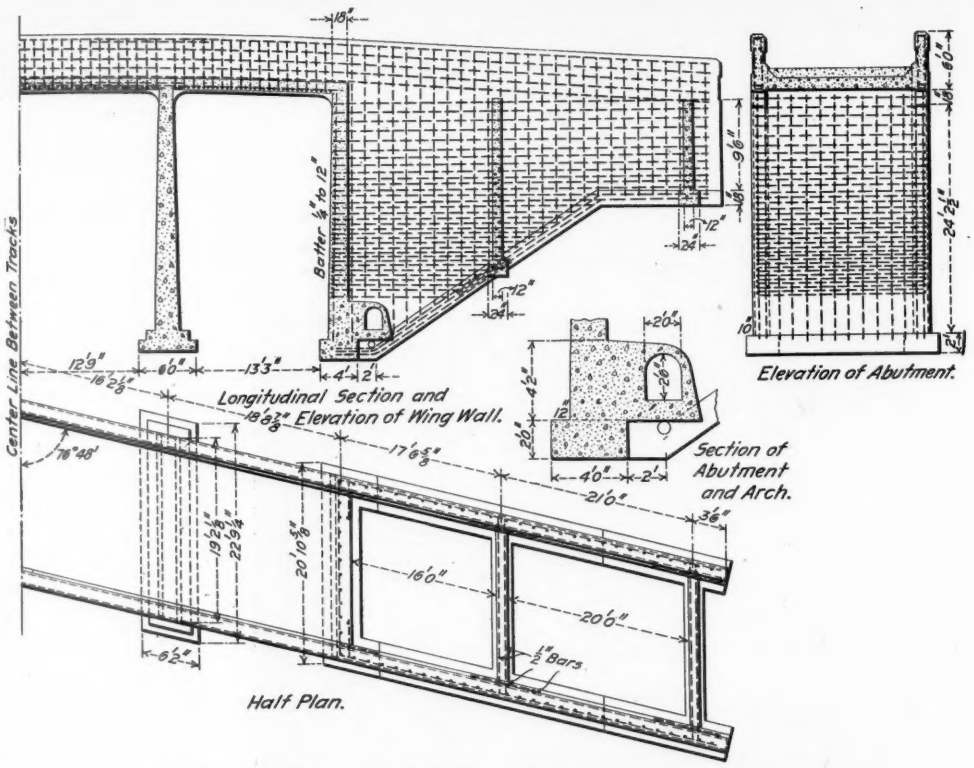
The photograph and drawings show a crossing built by the Vandalia in connection with line improvement work between Terre Haute, Ind., and Brazil. This bridge is near Seelyville. It is designed for four tracks, the central opening being 30 ft. between piers, and the side openings 17 ft. The latter are for proposed running tracks. The clearance is 22 ft., and the width, over all, 18 ft. 8 in. The floor of the bridge is on a vertical curve of 572-ft. radius, giving a 6 per cent. grade. Cross-sections show the floor construction and corrugated bar reinforcement. The filling for the roadway is 12 in. of gravel.

Overgrade Crossing near Seelyville, Ind.; Vandalia Railroad.

Another of these bridges was built near Turner, on the same work, the amount of material used in each of the two being exactly the same. Following is the cost of the Turner bridge:

Foundation excavation, 627 yds. at $0.40 ..		$250.80
Cost of placing:		
80 cu. yds. plain concrete at $3.45	$276.00	
466 " reinforced concrete at $3.65.....	1,700.90	
		1,976.90
Material:		
457 cu. yds. gravel....at $0.25	114.25	
220 " stone ... " .70	154.00	
786 bbls. cement ..... " 1.60	1,257.60	
28,807 lbs. bars. ..... " .02	576.15	
		2,102.00
		$4,329.70

This does not include the cost of grading the approaches. The specifications called for gravel concrete, but the gravel used was too fine and some 2½-in. stone was added. The material was furnished by the company and the work done by contract. We are indebted to Maurice Coburn, Engineer Maintenance of Way, for data.



Plan and Sections of Overgrade Crossing; Vandalia Railroad.

Drawings and a photograph of a reinforced concrete arch overgrade highway crossing designed by S. B. Fisher, Chief Engineer of the Missouri, Kansas & Texas, are shown herewith. Crossings of this kind are being put in as a part of the extensive grade revision and line improvement work being done by this road in the southwest, and are for country roads as well as city streets. Mr. Fisher objects to the form of overgrade crossing having rectangular openings, especially where permanent structures must be put in. To use his own words: "There always seemed to me something unsatisfactory in the appearance of the rectangular openings under these overgrade crossings as usually constructed. When made of wood they are not disagreeable to the eye, but when the form of a wooden structure is imitated in reinforced concrete it seems at odds with the fitness of things."

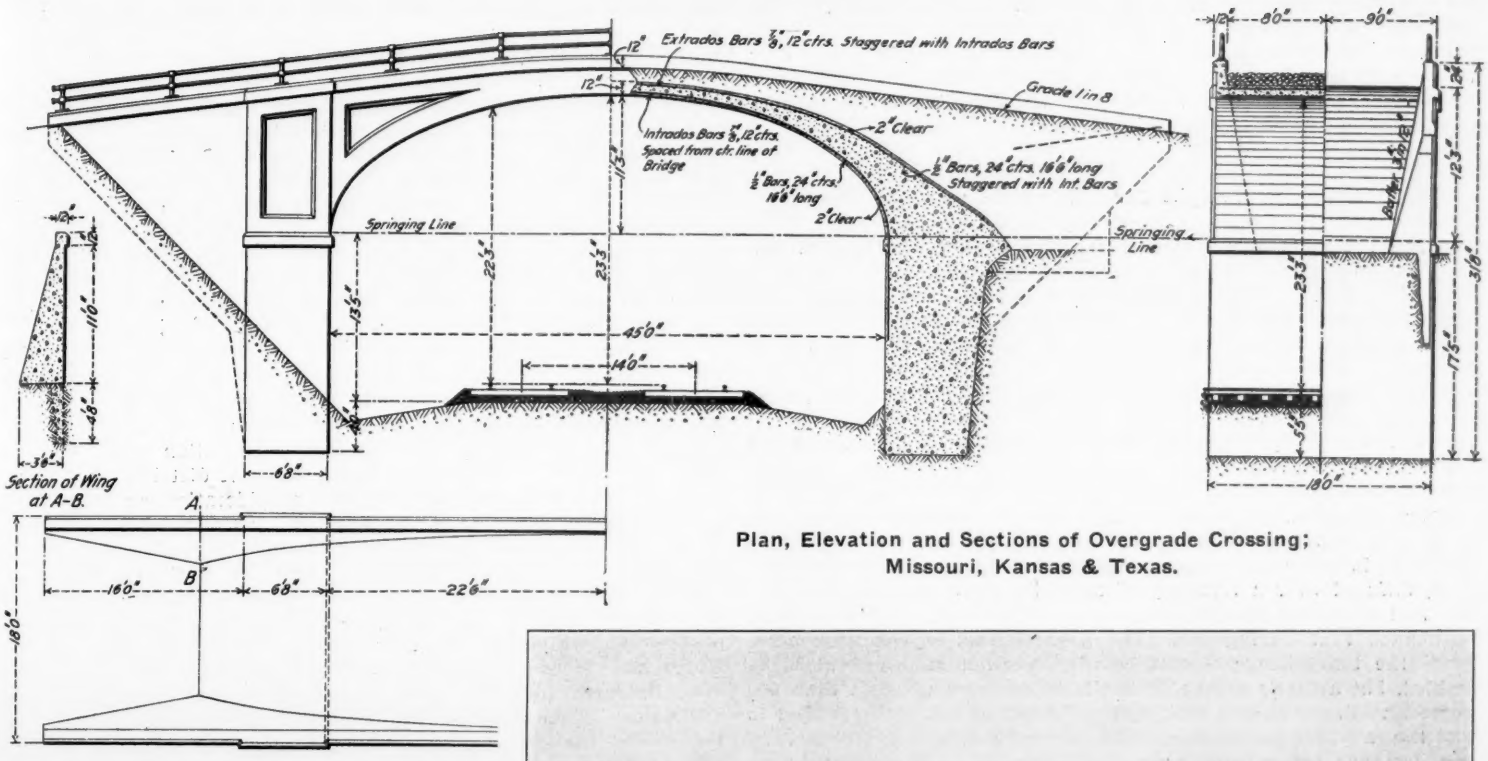
The bridge shown herewith is for a street or highway where the railroad cut is 10 ft. or more deep and the foundation is firm, preferably rock. The intrados of the arch is a true ellipse whose rise is one-fourth the span. The spandrel walls are carried back in cantilever form, as shown by the drawings. They have shallow panels moulded in them. The hand railing is made of old boiler tubes filled with grout to stiffen them and make them more durable. The horizontal tubes are connected with couplings and are continuous, passing through the crosses which are bored out for the purpose.

Details of the falsework are shown in the accompanying drawings. The same amount of thought was given to its design as to the arch, as it is made to be put up, used and taken down over traffic without any disturbance thereto.

Thus far, two of these arches have been built. One in the village of Caddo, Okla., with roadway 18 ft. wide, cost as follows:

Material for moulds, etc.	$369.75
Excavating foundation	183.56
Shoring, setting up machinery, all miscellaneous work	1,029.92
Concrete, about 349 cu. yds.	2,210.77
Hand railing	50.97
Total	$3,844.97

The other is near a section-corner in Oklahoma to take a north-



Plan, Elevation and Sections of Overgrade Crossing; Missouri, Kansas & Texas.

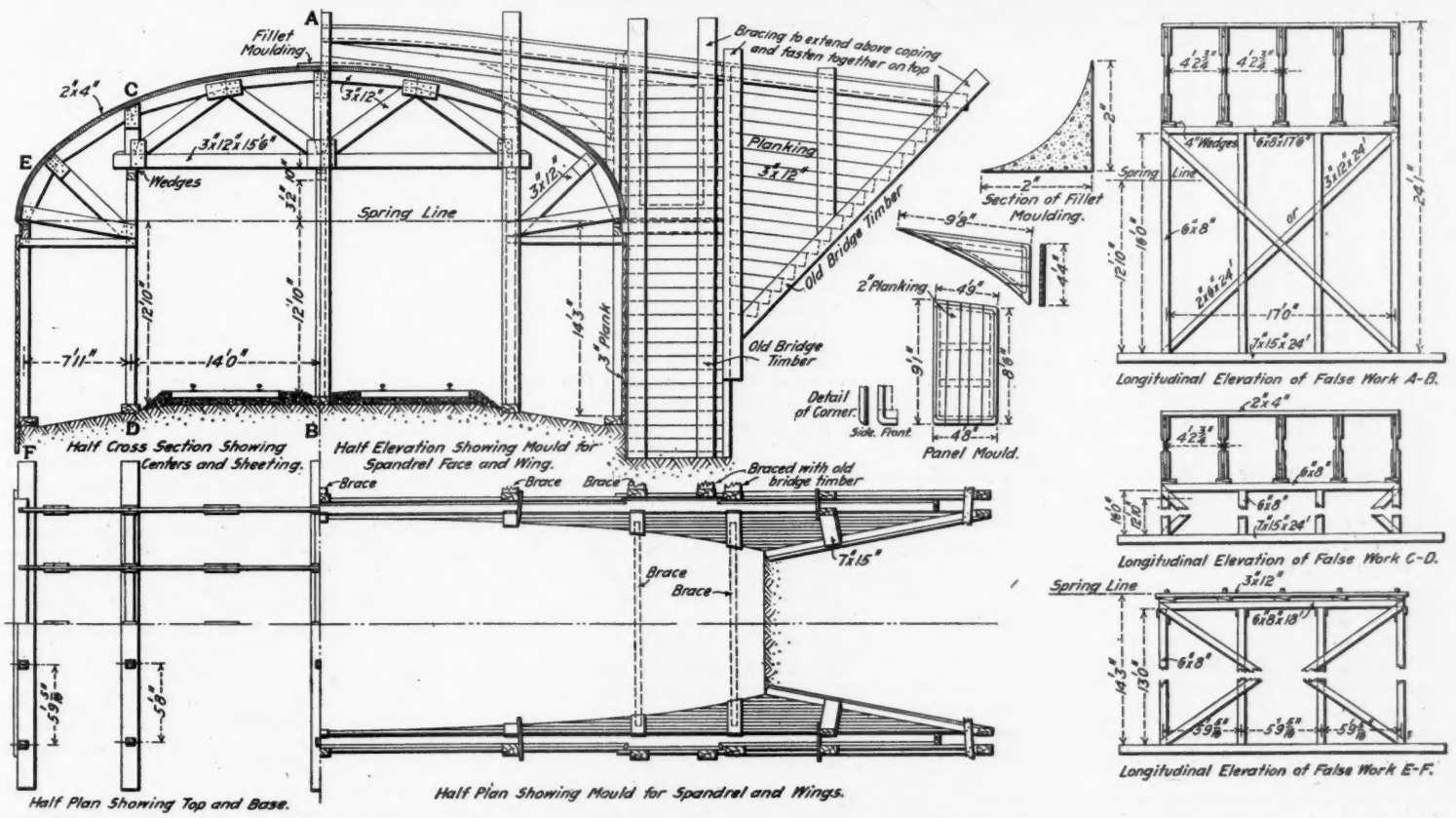
Overgrade Highway Crossing; Missouri, Kansas & Texas.

and-south and east-and-west public road. It has a 16-ft. roadway and was built with the same falsework as the first. The cost was:

Additional material for moulds	$51.35
Excavating foundation	167.40
Shoring, setting up machinery, all miscellaneous work	640.90
Concrete, about 390 cu. yds.	2,332,39
Hand railing	106.22
Total	$3,298.26

To the above should be added 50 cents per yard of concrete for freight charges on material. Plans are being prepared for another bridge for a street crossing in Fort Worth, Tex., with two 18-ft. roadways separated by a rib in the middle quite similar to the spandrel wall. This rib is intended to stiffen the arch and counteract any tendency of heavy and irregular traffic loads to distort it.

The span of 45 ft., shown in the draw-



Form for Erecting Highway Bridge; Missouri, Kansas & Texas.

ings, was selected as most suitable for a double-track road, giving sufficient room on each side for ditches. The clearance of 22½ ft. above the rail will probably be increased 6 in. or a foot in future structures; for while the present clearance is ample for some years to come, the unavoidable tendency of the track is to rise higher and higher as fresh ballast is put in.

Freight Car Efficiency.*

The railroads of the United States probably handled, during the year ending June 30, 1907, in the neighborhood of 1,800 million tons of freight. The freight handled by the whole of the railroads of teeming Europe can hardly have much exceeded 1,500 million tons. Physical conditions, and political prejudices and fears have co-operated in keeping at a low level the average haul in Europe, and consequently the more favorable environment here has placed the ton-mileage—the true measure of the freight service of a country—out of all comparison with that of the older continent. During the year named, the ton mileage of the United States probably amounted to 230 or 235 billions, against which Europe, so far as can be estimated, could not present more than about 100 billions. It goes without saying that enormous difficulties have to be met and overcome in order to administer successfully so huge a mass of business, diffused over a territory of more than 3,000,000 sq. mi. But the real extent of these difficulties is not realized until it is comprehended that during less than a generation—specifically, since 1880—the ton mileage of this country has not merely doubled or trebled, but actually septupled itself, an increase of more than 600 per cent. Under these circumstances, it would not be surprising to find the railroads experiencing difficulty in meeting the ever-increasing demands being made upon them, nor would it necessarily be discreditable to them that, in shaping their organization to the changing conditions, there resulted considerable friction of adjustment. Accordingly, the existence of shippers' complaints with reference to car supply, founded though they may be on facts, should not be regarded in itself as conclusive evidence of culpable negligence on the part of the managers of railroad transportation. Even without any special general development from year to year, every business has difficulties during the busiest season of each year in properly meeting the demands made upon the resources of its organization. In arguing thus, there is no desire on the part of the writer of the paper to justify the railroads in carelessness of management, whenever such exists, but his object is to deprecate the measurement of railroad performance by an impracticable standard, which the critics themselves would not consent to apply to their own business undertakings.

In the nineteenth annual report of the Interstate Commerce Commission on the statistics of railroads in the United States, figures are given covering the results of railroad operation during the year ending June 30, 1906, and a comparison of them with the corresponding figures for 1900 may serve as a text with which to introduce what I have to say. The ton mileage of the railroads operating in 1900 was 141,596 millions; in 1906, 215,877 millions—an increase of 52½ per cent., of which 40 per cent. occurred during the latter year. Though the mileage increased by no less than 31,017 miles during the six years, freight business was received and taken care of so well that the density of freight traffic, measured in tons carried one mile per mile of line, increased from 735,352 to 982,401 or about 35 per cent. The mere fact that the railroads were able to take care of this remarkable increase is an indication of the entire inappropriateness and injustice of those general charges of inefficiency which superficial observers, including some writers for the press, have felt themselves free to make. So great an achievement has been possible of accomplishment only by reason of the fact that past freedom of development (subjected though it has been to certain restrictions) has stimulated the growth of the most enterprising railroad policy in the world, admirably suited in many ways to its economic environment; it is not denied that this freedom has permitted some evils to thrive, though less during the last few years than previously.

The freight car equipment during the period was enlarged from 1,365,531 cars to 1,837,914 or 34½ per cent. At first glance this compares unfavorably with the 52½ per cent. increase of business. That this is not really so is obvious when the capacity of the car is taken into account. So far as I can judge from the equipment statistics, the increase of average capacity from 1900 to 1906 must have been close upon 20 per cent. Assuming that this increase of capacity were made full use of, the increase of car accommodation would be 61½ per cent. The enlargement of the freight car was not accompanied, however, by a raising of minimum weights, so that, in some cases, shippers made no practical use of the extra space facility. Hence, we cannot regard the whole of the 61½ per cent. as an actual increase of facility to the shipping public; it requires modification in proportion, as the average carloads shipped by the various industrial and commercial concerns were not easily susceptible of increase. It must be borne in mind that, primarily, the transition to higher capacity cars is in the interests of the railroad operator. Subject to a certain amount of qualification, it may be said that, under normal conditions, the shipper prefers smaller cars and more of them to larger cars and fewer of them. But, in either case, the practical meaning of the car to him is measured by the position of carload minimum, marking as it does a very considerable difference in transportation charges. Of course, in the long run, under a competitive régime, the shipper is deeply interested in the high capacity car proposition because its utilization, in preference to smaller cars, means greater economy of operation, part of the benefit of which is likely to go, sooner or later, to the shipper.

The idea suggests itself here that, while working towards the higher capacity car, the railroads would be unwise to attempt to impose it upon the shipping public unless the conditions of freight movement were favorable, otherwise considerable inconvenience might result to those whose business organization and relations could not readily be adapted to larger units of distribution. Thus, if increase of car capacity were the sole consideration, an increase of car equipment (but not of car numbers) corresponding with the growth of tonnage to be transported, though theoretically a desirable achievement, might be no small impediment to the manufacturer and dealer in their efforts to attain maximum business expansion. It is to the credit of the far-sightedness of the leaders of railroad policy that, while fostering, for several years, the growth of the larger and more economically operated car, they refrained from even the appearance of coercion in connection with their economical utilization. Thus from the beginning of the present century, the increase of car size steadily proceeded, generally speaking without any notable sacrifice of number, but the carload minimum remained stationary.

The last general movement in the direction of increase of minimum carload weights was, I believe, in 1899, when under the official classification, general weights were raised in all the classes from 20,000 to 30,000 lbs., after having stood at 20,000 lbs. for third class and higher, and 30,000 lbs. for fourth class and lower, during a number of years. At the same time, the Western classification minimum for lower than third class was raised from 24,000 to 30,000 lbs.; four years previously the minimum for lower than third class had been increased from 20,000. The Southern classification minimum of 24,000 lbs. for all classes has remained undisturbed, for all practical purposes, during the last 20 years. Recently, however, a movement has set in toward an advance of existing minimum weights, to accord with the very pronounced advance of the last few years in average car capacity, and this has already found partial, though not very startling, realization in the official classification.

The policy of the railroads, it is plain, has been marked in this regard by great conservatism, and they have amply showed their desire to allow reasonable time for the assimilation of shipping methods to the improved car facilities. They are hardly open to charges of arbitrariness or inconsiderateness in now attempting to take an active step toward the realization of aims long announced, looking to the more effective use of the car accommodation they have provided. If there be any room for criticism at all, it should be directed towards the actual increase of minimum weights in individual cases with regard to the effect of the same upon existing methods of distribution in the industries concerned. But no general opposition to the increase of minimum weights simply because it is an increase is logically well grounded under the conditions.

The possible effect of the actual organization of the distribution of products in hindering full use being made of increased car capacity, secured through the substitution of a smaller increment of higher capacity cars for a larger increment of smaller capacity cars, has now been considered. It may be further observed that changes in the general character of production, while not preventing full use of car space provided, may similarly hinder an increase in car capacity, equaling in percentage the increase of business to be handled in ton miles, from establishing an equality of adjustment of freight equipment to traffic. The character of the tonnage may have altered so that equality of car adjustment can be secured only by a relative increase of car capacity. For instance, to take a hypothetical case of as simple a character as possible, if the tonnage at the beginning of the period of comparison were three-fourths coal and pig iron and one-fourth merchandise and hay, whereas, at the end of the period, the proportions were half and half, each cubic foot of car space would be less efficient on account of the greater space demand of each average ton of freight carried. To some extent, a movement of this kind has been in operation, but by reason of the continued marked preponderance of heavy freight in railroad tonnage, probably not sufficiently to reduce very materially the effectiveness of increase of car accommodation calculated on nominal capacity, yet it is worth bearing in mind that the real working capacity of a car is not its stenciled maximum, or, rather, that plus the additional 10 per cent. allowed, but the average ton-

*From a paper presented at the April meeting of the Western Railway Club, by E. R. Dewsnup, Professor of Railway Administration, University of Illinois.

nage it can accommodate of the class or classes of freight it is commonly required to convey.

So far as the practical results of American freight operation of recent years are concerned, it is not at all difficult to demonstrate that, coinciding with the movement toward a high tonnage car, there has been a material increase in average load, indicating that, to a certain extent at least, such a car has proved adaptable to modern methods of industrial distribution. To quote a few roads indiscriminately, the average carload per loaded car during the period 1900 to 1907, increased with the New York, New Haven & Hartford from 10.2 to 13.4 tons, with the Norfolk & Western from 19.9 to 25.5, with the Wabash from 14.9 to 18.1, with the Louisville & Nashville from 15.3 to 18.7, with the Illinois Central from 13.7 to 17.8, with the Southern from 12.7 to 14.8, with the Chicago & North-Western from 13.8 to 15.3, with the St. Louis & San Francisco from 13.6 to 15.9, with the A., T. & S. F. from 12.7 to 15.5, with the Northern Pacific from 13.4 to 17.8, and with the Great Northern from 16 to 20.4 tons. According to the 1906 statistical report of the Interstate Commerce Commission, the loaded freight car miles for that year amounted to 11,410,599,327 and, as before stated, the ton-mileage to 215,877,551,241. From these figures it appears that the average load per loaded car of all systems was 18.9 tons. It is impossible to say exactly what the average load was for 1900 on account of the failure of the Commission to collect and publish loaded car mileage before 1901, and, by the way, its Public Service tables still neglect the average load per loaded car. However, the average load for 1901 was 16.5 tons, and after an examination of the reports of a considerable number of railroads I am inclined to think that for 1900 the corresponding figure must have been approximately 16⅛ tons. Thus the increase of average loss per loaded car was about 17 per cent. The proportion of this increase due to higher capacity equipment and to improved loading methods respectively are not capable of being determined. After having observed loading methods fairly closely during the period, it does not strike the writer that there has occurred any particularly marked advance in this direction. The exceptions to this general statement are but sufficient to prove the rule. Accordingly I prefer to credit the higher capacity equipment with the greater part of the improvement. From 1900 to 1906, then, a 20 per cent. increase in average capacity has been met by a 17 per cent. increase, or thereabouts, in average load, indicating, as already remarked, the suitability of the high capacity car, within certain limits, to present industrial conditions. From this it follows that the deduction to be made from the 61½ per cent. increase of total car capacity during the period of our comparison, on account of shippers being unable to use to advantage the extra space of each car, is but small and assuredly not sufficient to reduce the per cent. increase of effective accommodation below the 52½ per cent. increase of business.

In the matter of adequacy of car accommodation, therefore, I fail to see how there can be any reasonable dissent from the conclusion that, under the unprecedented boom of business, the railroads as a whole have done astonishingly well in keeping their equipment level, and probably more than level, with the rapid increase of agricultural and manufacturing output.

I say this of the railroads as a whole, thus qualifying my statement because there are individual roads of which it could not be made, just as there are other roads of which more than this could be said. Quite a few railroads have not only managed to keep level with present needs, but have even anticipated future requirements, evidently determined, whatever the cost may be, to provide an adequate amount of car accommodation for their patrons. On the other hand, there would appear to be roads who are not indisposed to piece out their own inadequate car resources with forced loans from their more plentifully supplied neighbors, a larceny which the current of traffic hinders these good neighbors from effectively stopping. The saying attributed to a certain wit: "God help you if you get into the hands of your friends," is entirely apropos of the freight car situation in some respects. Curiously enough, some of the roads which, according to the bulletins of the committee of car efficiency, have been maintaining on their lines a marked excess of cars (amounting, in one case to 50 per cent., and at times to 100 per cent. over the number owned),[1] have really not done badly in the increase of their cars during recent years as compared with the increase of their business. For instance, in the case to which I have made reference the company increased its freight cars during the seven years ending in 1907, 51 per cent., as against an increase of ton mileage of 44 per cent., the difference being still greater in favor of the equipment when capacity is taken into account. Its record of ton miles per freight car in 1907 does not appear excessive on the face of it, when compared with that of numerous other companies. Of course, the explanation of its persistent retention of foreign cars lies in the nature of its tonnage which is comparatively light and bulky, thus necessitating a large proportional number of cars than is necessary for roads with heavier freight; its own equipment was evidently inadequate in space accommodation in 1900 (possibly lethargic car movement played some part) and the improvement accomplished subsequent to that date was obviously insufficient to reduce to really moderate proportions its demands upon foreign equipment. The light and bulky nature of the freight carried, occupying much car space per ton, explains also the moderate car ton-mileage record.[2] The unfortunate feature of a policy of foreign car detention is that it necessarily deprives other roads of equipment, usually at the time when it is particularly needed, so that the whole car situation of the country is disturbed. The railroads of the middle West with their extensive forwarding business are conspicuous sufferers, and the roads in New England, on the Pacific slope and in the Southwest conspicuous gainers by the interline shuffling of cars. In the old days, when freight was transferred at every junction point, it was necessary for each participating carrier to own sufficient cars to haul the freight over its own lines. It would seem proper that the introduction of interline organization should not change this requirement. Of course, the proportion of home and of foreign cars on the lines of a railroad will be determined to a great extent by the direction of the stream of traffic. Lack of promptness in handling foreign cars will soon swell up the number of such upon a road with the stream of traffic traveling toward it. Given a fairly dense and growing local traffic, substantial moral fiber is required to resist the obvious temptation—sometimes the moral element fails to make good. On the other hand, roads doing a large outward, but comparatively small inward, business must make allowance for this extra drain in the extent of their equipment. They must expect to be regularly deprived of the use of a certain proportion of equipment, and it is up to them to do the best that they can to keep track of its movements and to secure the enforcement of mutually agreed upon regulations directed toward securing prompt return.

One of the difficulties connected with per diem as a means of stimulating the prompt handling of foreign equipment is that at the times when cars are in most demand it is least effective. Whether the cost of car hire be 20, 25 or 50 cents a day, or even $1, it is obviously to the interest of a road short of cars to retain foreign equipment if, during the rush of business, the cars are capable of earning more than sufficient to cover operating and per diem expenses.[3] Conversely, when business is dull and cars less urgently needed by the home roads, low car earnings stimulate the effectiveness of per diem to the cost of, it may be, unnecessary empty mileage. There seems much to be urged in favor of a variable per diem charge, especially if handled, along with the whole matter of car interchange arrangements, by some permanently organized central bureau of the railroads. This is a tempting subject to dilate upon, but one impossible to discuss adequately in this paper.

Reference to the problem of car interchange brings our discussion very close to the matter of car shortages, the recent acute attack of which was so dramatically terminated at the close of last November by the financial crisis, whose industrial effects are still lingering with us. The more one studies the car situation in general, the more one realizes that the intensity of such car famines, as they recur from time to time, could be materially relieved if more skilful attention were applied to the supervision and improvement of the distribution and of the mileage performance of cars both in local and in interline business, the crowning difficulties of railroad operation. In speaking thus, it is not intended to have inferred that, under any reasonable economical system of car equipment, the

[1] The statement refers, of course, to the period prior to the present abnormal depression.

[2] Heavy freight would have revealed a striking ton-mileage per car. The car ton-mileage, at any one time, is the quotient of the total ton-mileage divided by the number of revenue cars owned. In general, this represents sufficiently accurately the performance of the average car on the normal railroad, but not in the case of roads, with large standing excesses of cars (or the reverse); the real work secured by such railroads out of the cars operated by them can only be obtained by substituting, as the divisor, average number of cars on line for average number of cars owned. Allowance needs to be made, of course, for private cars.

[3] Suppose that, during the very active season of the business year, a car is capable of earning $2.50 a day after the costs of hauling the car and handling the freight (but not the maintenance charges against the car) are deducted. The railroad has more business than it can handle promptly with its own equipment, and therefore, must either build extra cars just for the traffic of this road, or it must borrow. If the period extends over, say, three months then, if it builds, it ought to debit all expenses of the cars to that short period. These expenses in the case of a modern car, a 40-ton steel underframe box car, for instance, probably average about 40 cents a day, the expenses of maintenance and renewals being distributed over the year, the car being assumed to be in more or less constant use. The estimate is based on $1,025 as the cost of such a car, with 20 to 25 years as average life, 5 per cent. interest on cost of car, $85 or thereabouts as cost of repairs and renewals, allowance also being made for maintenance of repair tracks and sheds, tools and the like, including interest on capital invested in them. But in the case before us, these expenses have to be distributed over but three months, allowance being made for lighter repairs, longer life of car, etc., on account of its more limited use. It is not possible to do more than estimate very roughly the appropriate charge against each day of the earning period, but it probably would not be less than $1.25 a day. Thus to earn the assumed $2.50 a day, the railroad must spend (and could well afford to spend) $1.25 a day during the period of the employment of the car if it should provide its own car. But if it borrows other companies' equipment for the period, it will incur hardly any maintenance charges, probably not amounting to as much as 25 cents a day, at the most. So that, under the assumed conditions, there is no inducement for the road to provide its own extra equipment, even if a dollar per diem were levied upon it, and, with a 50 cent or 75 cent per diem, it is considerably in pocket by borrowing equipment which it can send home as soon as it has no further use for it.

railroads could obviate such shortages. As a matter of fact, the charges of gross inadequacy of equipment, so freely made by choleric shippers during periods of car shortages, are based entirely upon the reasoning that there is a shortage, that the railroads have no business to allow a shortage to take place, and that its existence is sufficient evidence of wilful neglect on the part of the railroads to provide a proper amount of equipment. No consideration is given to the relation of that equipment to business requirements during the periods when surpluses take the place of shortages nor to the possible loss which may result to a railroad maintaining an extra supply of cars whose service is necessary, perhaps, only three months out of the twelve. Unless the daily earnings of such cars during the limited period of their necessary service are sufficient to cover not only the costs of handling the freight, of moving the cars, of use of roadbed, terminals, motive power and so forth, but also interest on capital invested in the cars, maintenance charges, depreciation and insurance, and storage accruing during the whole year, it is patent that the provision of such cars would be a pure act of charity on the part of the railroads, and in no sense a commercial transaction. I am not going to assume gratuitously that it would be necessarily unprofitable for any specified railroad to provide this extra equipment, but note the possibility as something that needs to be investigated before charges of incompetent management are rested simply on shortages in car supply during busy seasons. And in connection with estimation of car shortage, it should be noticed that the extent of the same is not accurately measured by shippers' demands, since they frequently order more cars than they really need in the hope of securing a larger number than they would otherwise be likely to do. The actual shortage at any date is, undoubtedly, less by a considerable percentage than the total of the shippers' nominal requirements.

Moreover, while this shortage is a very real difficulty at the times of its recurrence, it is, in large measure, the result of a tendency on the part of shippers to keep their stocks down to the working minimum, frequently involving procrastination in the ordering of their supplies. An annual example of this is to be found in the coal trade in which the dealers regularly fail to make long enough preparation ahead for the fall trade, so that, with the advent of the cold season, orders for cars are rushed in with instructions that they are to be treated as urgent. They (and many others) are anxious to combine all the advantages of keeping as little capital as possible tied up in their stocks with an absence of all the disadvantages that naturally attach to the undue crowding of business. A little earlier preparation, even if at the expense of tying up more capital in the shape of stocks and storage facilities, would, in many cases, be entirely reasonable, and a legitimate expense of the business. At any rate, if this natural organization of their business arrangements is not attended to, such traders hardly ought to feel aggrieved if their aggregated demands make it impossible for the carriers to reply as promptly as they desire.

From what has been said, it must not be supposed that the railroads, on their side, are keeping down equipment to the level of the traffic of the least active seasons. As a matter of fact, they are providing cars in marked excess of this, and an appreciable portion of their equipment is lying idle or running light during the "off" season. The actual extent of their equipment is a compromise between the requirements of the periods of maximum and minimum trade. The railroads, of course, will continue to increase equipment so long as there is a reasonable profit arising from the receipts of the car during its active period after deducting the charges against it during both active and inactive periods. It is not easy to see how more than this can be expected from the railroads,[4] though it may happen, in consequence, that cars demanded during only three or four months of the year are not supplied. Shippers do not always realize that the surplusage of cars is quite as important a matter to the railroads as shortage is to them. The railroads are most keenly interested, naturally, in balancing supply with average demand, though even then they are liable to be hit pretty hard by business depressions, as witness the 300,000 car surplus during the past two months, the expense of whose enforced idleness (if cost of repairs, renewals, insurance, interest and storage be considered as distributed equally throughout the year) can hardly have been less than $4,500,000.

There are then, difficulties on both sides. But I have already indicated that shortage evils are accentuated among the roads themselves by the action of certain companies in persistently retaining and improperly using the equipment of other lines, thus reducing the pressure upon themselves, but, at the same time, causing it to be more widespread. Per diem arrangements so far tried, though an improvement upon the old mileage system, have failed to bring about an equitable distribution. A resort to car pooling methods really appears to be the only alternative, if economy of equipment is to be a consideration at all. Granted that capable administrators can be found to take charge of such pools—and no one familiar with the official personnel of the railroads would deny this—their influence upon the car situation in general would be very real. Possibly, there could be established district pools with jurisdictions covering, say, official classification territory, Southern classification territory, the Southwest, the St. Paul, Chicago, St. Louis, Kansas City and Denver territory, and the territory between the latter and the Pacific coast, each of these district pools focusing in a central distributing office, which would receive full reports from the district pools and would arrange for transfer of equipment from district to district when necessary. In each district, the pooling principle could be made to apply separately to each of the major varieties of cars, and possibly, though the practicability of this is not quite clear, with a rough reference to their capacities. I have sufficient faith in the genius of the American railroad man to believe that the details of some such plan could be worked out satisfactorily. It is not unnatural that reluctance to enter into a car pool arrangement should arise from the dislike of some roads to hand over the management of a part of their equipment to an external authority, and from a fear that they will thereby get the worst of the transaction. Indeed, it is very likely that, during the formative period and early operation of such a scheme, equitable distribution would fail, at times, to be attained, but, in the long run, it would surely work out to the general advantage of all the roads concerned, except in the case of those who now habitually rely upon other people's supply to make good their own deficiences, and these we are not called upon to take into consideration.

Before concluding this paper, I should like to supplement the figures, with which the discussion of adequacy of car equipment was introduced, with one or two more relating to the cognate and equally important question as to how far such equipment is used efficiently. We have seen that the typical car of 1906-7 is considerably larger in capacity than the typical car of 1900; it is also performing a somewhat greater actual service. The real efficiency of a freight car is the resultant of two forces, if I may borrow the language of mechanics, one the average load, the other the mileage it covers, that is, its average rate of movement. Put into figures, the measure of this product in 1906 was 117,450 ton miles as against 103,700 ton miles in 1900, an increase of 13,750 ton miles per car, equivalent to 13¼ per cent. The average load for 1900 has been estimated at 16⅛ tons, and from this it follows that the loaded miles per car averaged 6,285; in 1906, the corresponding figure was 6,208. This indicates a backward movement so far as the matter of car movement is concerned. But there are reasons why this result should not be accepted at its face value. By reason of the absence of proper statistical data covering the whole of the railroad systems of the country during the years of comparison, I have been obliged to base the loaded mileage performance of each car upon the number of revenue cars owned at the end of the fiscal years. Obviously, the car mileage is made by the average number of cars owned throughout the year. If it were to be assumed that the net increase of cars, during 1900 and 1906, respectively, took place uniformly during these years, then the figures given above would be changed to 6,450 and 6,396, the decrease of miles per car being thereby reduced from 77 to 54. In dealing with the comparison of individual railroads, it would be necessary to take into account the fact that, at different periods and with different roads, the proportion of cars used in making the mileage to cars owned may vary, but, in dealing with all systems collectively, this is obviously unnecessary.

A further reason for neglecting the apparent decrease in car mileage lies in the omission of privately owned cars from the calculation, though the results of their movement are included in the record of total loaded car miles. If the proportion of private cars were the same in 1906 as in 1900, the net decrease as shown above would be slightly reduced, though the percentage of decrease would not be altered, of course. Private car statistics are not available, but I should take it as unlikely that such cars attained quite as large an increase (relative) as railroad owned cars, and, if this be true, a more appreciable reduction in both the absolute and the percentage decrease took place. For instance, private cars in 1900-1 were estimated to equal from 7 to 8 per cent. of railroad freight car equipment. If, during the following six years, they increased but 20 per cent. in number as against the 35 per cent. of railroad owned cars, the net decrease of loaded car miles per car would be reduced from 54 to 19.

A still additional reason for modifying the result first arrived at is to be found in the varying nature of railroad tonnage over the period. Coal and other mine traffic tends to limit the mileage performance of the cars engaged in it and, when such traffic increases more rapidly in volume than the rest, the effect upon general car mileage average is depressive. Undoubtedly, this has taken place, to a certain extent. The products of mines in 1906 accounted for more than 53 per cent. of total originating tonnage, whereas, in 1900, the proportion was slightly over 52½ per cent. Mineral ton mileage and car mileage figures are not accessible but, no doubt, this movement is reflected in them, and though the difference in percentage is hardly large enough to exert much influence upon the average in car, it would probably be sufficient to wipe out the decrease with which the present analysis of car mileage averages started.

[4] In the matter of car equipment, that is, as apart from the question of car movement.

It is satisfactory to find that, the railroad freight service being taken as a whole, there has been no absolute retrogression in the movement efficiency of the freight car, and yet unsatisfactory not to be able to say more than this. The efficiency of the freight car of 1906 over the car of 1900 is due entirely to improved load; there has apparently been no appreciable improvement in the average number of miles traveled per annum. Except in so far as the trader was able to secure lower rates, a supposition hardly justified by the facts, the benefits of the increased efficiency of the freight car during the period 1900-06 must be regarded as having been in favor of the railroad rather than the trader.

It is a somewhat remarkable fact that the power and ability displayed by railroad managers in so many directions has been unable to secure tangible improvement in a matter which is more vital than most things to the really economical and successful handling of a railroad. In scanning the results of freight operations during the half dozen years covered by the main figures of this paper, one may observe with pride the handling of an increase of business of 52½ per cent., with a train mileage increase of but 14 per cent. (492½ millions to 559½ million miles), and a consequent increase in train load of 42 per cent. (271 to 385 tons), accompanied by an increase of 17 per cent. or more (16⅛ to 18.9 tons) in car loading, but car mileage—the less said about it the better! Perhaps, it is incapable of improvement! But the query is inevitably provoked as to whether some of the improvements named have been purchased at too high a cost. The bulletins of the committee on car efficiency reveal great differences between the various roads in the mileage results obtained from their cars. Unquestionably, varying physical and economic conditions play an important part in these differences, yet one cannot help but believe that the personal equation, the organization of the railroad, is no trivial factor. To take but one illustration, the reports published impress one with the idea that a great deal of misapplied economy is frequently exercised with regard to shop repairs. No doubt, a road hauling heavy tonnage over adverse grades and around sharp curves must expect to be troubled more with the question of car repairs than a road working under the reverse conditions. Yet even in this case, the loss of car time may be seriously increased by lack of proper provision of shop facilities, usually a poor kind of economy, and, to the extent to which shop repairs accumulate, a lessening of the effective equipment of the road. In studying the returns covering July, 1906, to August, 1907, one is surprised, again and again, by the high percentages of cars in shops, and high not merely during the period of slack business. Some roads apparently maintain, during the major part of the year, 8, 9, 10 per cent. of their freight equipment, or even more, as shop ornaments. More attention needs to be given to shop policy, and, one might add, to the treatment cars receive in the yards; with the needed improvement, one hindrance to better freight car performance will be removed.

Yard working affords even more fruitful opportunities of improvement. Terminal yard delays is a vexed problem that is apparently eternal in nature. Poor yard design, or, to be more correct in many cases, lack of design, has been condemned again and again as too common a feature, but it is by no means an unknown thing to find the evils of bad design supplemented by those of poor organization and still poorer management. I think a mistake has been made frequently in locating terminal yards too near the centers of the cities, though sometimes the growth of a city has been so rapid as to reach out to fairly distant sites, crippling the possibilities of their expansion by the immense resulting increase in land values. Again the storage privileges of terminal yards have been notably abused. To judge by the space which railroad managements are often prepared to assign to storage tracks in response to the "needs" of the shippers, they do not always realize that, in the physiology of the yard system, the function of the storage yard is about that of the vermiform appendix. It is satisfactory to note, however, that demurrage regulations are being rounded into more uniform shape over the country at large and, with their steady enforcement, less trouble from shippers' delays can be expected.

Much more could be profitably said about the influence upon loaded car mileage of such trans-shipping arrangements as the Pennsylvania provides at Fort Wayne for the making up of "through" loaded cars at that point, thus reducing the pressure upon the Chicago yards, and much more upon the general extension of "consolidation" arrangements in relation to both increased average loading and mileage. A further interesting question is that of adequacy of motive power and the desirable ratio of such power to freight business and equipment. In this matter, as in so many others, there are marked differences in the practices of the various roads, the justification of which it would be desirable to have explained.

The lack of progress along the lines of car mileage is in such astonishing contrast with improvement in other branches of railroad operation, that everyone feels that something should be done to remedy the situation. There are many factors contributing toward a low daily car mileage which are unavoidable, but advance along the lines suggested, and, perhaps, more radical measures, will certainly do something toward raising the present standard.

The previous statistical analysis rests upon figures covering the operations of all systems, both large and small, during the years 1900 to 1906. It will be interesting to see how the general results are borne out and, indeed, emphasized, over a larger period, by the statistics of a group from which very small roads are excluded.

These are compared below, in the case of 31 railroad systems, some of the operating results of 1907 with the corresponding ones of 1897, a ten-year period. The roads whose statistics were available are the following (arranged in alphabetical order):

A. G. S.	Louisville & Nashville.
Atch., Top. & Santa Fe.	Michigan Central.
Baltimore & Ohio.	M. & O.
Boston & Maine.	Mo. Pac. and St. L., I. M. & S.
Central of Georgia.	N. Y. C. & St. Louis.
Chesapeake & Ohio.	Norfolk & Western.
Chic. & E. Ill.	Northern Pacific.
Chic. & North-Western.	Pennsylvania Railroad.
C., C., C. & St. Louis and P. & E.	Rock Island.
Chic., Mil. & St. Paul.	St. Louis & San Francisco.
C., New Or. & T. P.	St. Louis Southwestern.
Erie.	Southern.
Great Northern.	Texas & Pacific.
Grand Trunk.	Union Pacific.
Illinois Central.	Wabash.
Kansas City Southern.	

In 1907 these railroads were handling considerably more than half the railroad traffic of the country, and hence, in spite of some prominent omissions, are well representative of the more important systems. They owned 538,830 revenue freight cars in 1897 and 1,065,548 in 1907, an increase of 97.8 per cent. In calculating the average capacity of these cars, I have been compelled to omit, in 1897, the L. & N., N. P., Rock Island, Mo. Pacific, B. & O., St. L. & S. F., Southern, C. of G., and K. C. S., representing a total of 140,074 cars, on account of average capacity for that year not being ascertainable, but I have added to the list previously given the C., B. & Q. with 36,469 cars. For 1897, accordingly, the average capacity has been based upon 23 roads with 435,225 revenue freight cars, having a total capacity of 9,780,211 tons, thus giving an average capacity of 22½ tons. For 1907 I have had to exclude four roads, the L. & N., C. of G., K. C. S. and Mo. Pacific, with 94,348 cars, but have again added the C. B. & Q. with 47,164 cars, making a net total of 1,018,364 cars, having a total capacity of 34,481,517 tons, or an average capacity of 33.9 tons. On account of the large number of cars included in the calculations, the omission of the roads named cannot materially affect these averages. An increase from 22.5 to 33.9 tons represents a percentage increase of 50.7, from which we can see, much more clearly than in the case of the general statistics covering the shorter period, the really great advance made by the larger and more progressive roads in the direction of the increase of car capacity. When this 50.7 per cent. increase of car capacity is combined with the 97.8 per cent. increase of car numbers, an increase of 198 per cent. of car accommodation is shown. How does this compare with the growth of business handled by these roads? The 31 systems handled, in 1897, 53,046,151,280 ton miles; in 1907, 136,037,276,970 ton miles, so that against the 198 per cent. of car accommodation there has to be set only 156½ per cent. increase of ton mileage. The average load per loaded car mile was 13.4 tons in 1897, and 19 tons in 1907, an increase of 41.8 per cent.[5] This substantiates the statement made in the body of the paper that there has been evidently a fairly economical utilization of the extra capacity of the enlarged car.

With respect to car movement figures, the 3,901,494,854 loaded car miles of 1897 represented 7,407 loaded car miles per revenue car owned. In 1907, the 7,143,781,875 loaded car miles average out to but 6,704 loaded miles per car owned, an apparent decrease of 9½ per cent. With some of the most important roads included in the averages, the decrease reaches as high as 15½ to 19 per cent. As noted already, these percentages would undoubtedly undergo reduction if adjustment were made for (1) average number of cars owned throughout each year; (2) railway cars owned but not on lines, or vice-versa; (3) average number of private cars operated throughout each year, and (4) proportion of coal and similar car delaying traffic to total traffic. It will be understood from previous remarks that the percentage results can be affected by adjustments under these four heads only when there is, in any of the cases, a percentage variation in the years compared. Should the proportions remain the same the percentage of decrease could not be influenced by such adjustments. It is not unlikely that some roads would find it extremely difficult to account statistically for the whole of the decrease.

Japan's acquisition of the railroads of the country for its state system seems to have been untimely to say the least. It was undertaken just after the great war which had brought the country much glory but no money, and had enormously increased the national debt. Then the railroads needed great expenditures for improvements. The Minister of Transportation asked for $180,000,000, to

[5] The average is based on the 31 roads named in the list with the exception that the Boston & Maine could not be included in the average for 1897 on account of the absence of loaded car-mile figures for that year.

be expended within 12 years. But the Cabinet would only appropriate $15,000,000 at this time, and the authorities finally limited the amount to $12,000,000, whereupon the Railroad Minister resigned.

How Can the Railroads Best Serve the Public?

1. For the protection alike of those who have invested their money in railroads, and of the public served thereby, there should be a local ownership of shares, and that ownership as widely scattered as possible among the greatest number of people.

2. Directors should make full and frequent reports to their stockholders, and encourage the latter to question and discuss them at their meetings, as is done in England, in advance of declaring dividends.

3. Stockholders should realize they are partners in a common venture, and that it is their duty, alike on moral grounds and on grounds of self-interest, to hold their directors, as trustees, to frequent accounting and a strict accountability for all their acts.

4. The use of the misnomer, "interstate commerce," be discontinued, as the word "inter" means "between" rather than "among." The thing really is "domestic commerce."

5. The supervision of railroads should continue as at present under state and federal authority:

(*a.*) The state to exercise such measure of regulation as shall provide for the local trade therein prompt, frequent and safe service, adequate to the growing needs of the public and to retain all its police powers.

(*b.*) The larger matters, which really affect "commerce among the several states," being relegated to federal control, if need be, through an amendment to the constitution.

As to federal regulation:

6. Measures should be taken to expedite the investigation and determination of all questions affecting commerce among the several states, by putting the administrative work under the direct control of the executive, entrusting the judicial determination of all such questions to the judiciary, and leaving with congress itself all the legislative power.

7. The attempt under the present law to delegate to one body functions which our constitution has vested in the executive, legislative and judicial branches of government separately, be given over. A purely administrative body should be created as a part of one of the departments of the executive. Preferably this should have at its head one man as a "commissioner of domestic commerce," occupying, in respect to all companies engaged in transportation among the several states and territories, whether by land or water, much the same place as the comptroller of the currency does toward the national banks. He should be aided by such assistants in various parts of the country as may be necessary, and authorized to call upon the other departments of the executive, particularly the department of justice, and the secret service bureau, for assistance at all times and in all places. To this commissioner each company should make periodic reports, and it should be his duty to see that steps are promptly taken to enforce the law in every particular and in every case.

8. The judicial functions hitherto exercised by the interstate commerce commission should be relegated to the courts, where they properly belong. If needed, additional district and circuit judges should be appointed. I would not favor, as was, I believe, proposed some years ago by your distinguished fellow citizen, the Hon. Richard Olney, the creation of special courts in which to try cases relating to "commerce among the several states," because all citizens have an equal right to be heard in the same court.

9. The attempt by congress to delegate the legislative function of fixing in advance the rates be abandoned. At best, it is of doubtful constitutionality. All disputed cases before the interstate commerce commission must eventually be passed on by the courts; congress should, therefore, so legislate as to really expedite the final decision of such cases.

10. And lest it be said that I have left out the vital question of rates:

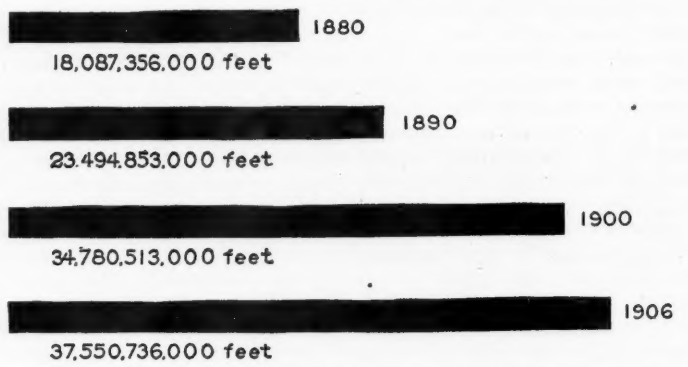
Let it be also provided that rates shall be fair in themselves; that is, above the cost of rendering the service, and below its value, which, while remunerating the owners, shall not restrict trade, but shall tend to stimulate its development. Such rates to be open and equal to all under like circumstances, and subject to legislative revision and regulation. Every trick and device in respect to them to be so promptly detected and punished, that those guilty of the offense shall be deterred by fines, and, if need be, prevented by imprisonment from repeating it.

It is obvious that this final recommendation contains nothing more than the Common Law has always provided as to carriers' charges. The time is coming, indeed it is at hand, when we will do well to revert to the practice of our fathers in basing our action on the Common Law, which, while called the "Sum of human wisdom," is but common sense and common honesty, as practised for centuries by intelligent free men. —*Stuyvesant Fish.*

The Drain on the Forests.

The Forest Service has issued a pamphlet by R. S. Kellogg, Chief of the Office of Wood Utilization, describing the annual consumption of wood in the United States and the timber supply available for the future. This is accompanied by several charts, most of which are reproduced herewith. These charts and the information given in the circular are based, with the exception of those for mine timbers, on statistics of forest products for 1906.

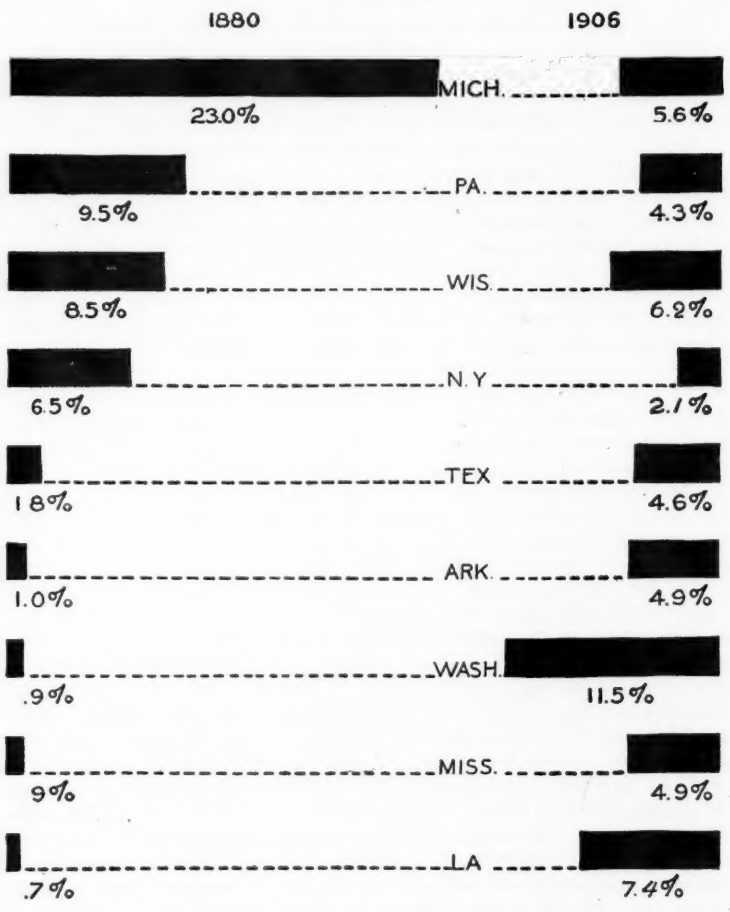
The total quantity of timber used annually for lumber, shingles, hewed cross ties, domestic pulpwood, cooperage stock, round mine timbers, lath, wood for distillation, veneer, and poles (these products being mentioned in the order of their production during 1906) is equivalent to about 50 billion board feet. Of this amount lumber makes up about 37 billion board feet, which is about three times as much as for all the other items combined. Shingles and hewed cross ties each require about three billion board feet, and pulpwood about two billion.



Lumber Production of the United States in 1880, 1890, 1900 and 1906.

The cut of lumber by kinds of woods in 1906 is shown by the accompanying diagram. Yellow pine furnished 31.1 per cent. of the total, Douglas fir 13.2 per cent., white pine 12.2 per cent., hemlock 9.4 per cent., oak 7.5 per cent., spruce 4.4 per cent., and western pine 3.7 per cent. These seven kinds of timber furnished over four-fifths of the total. The production of no other kind was as much as one billion feet.

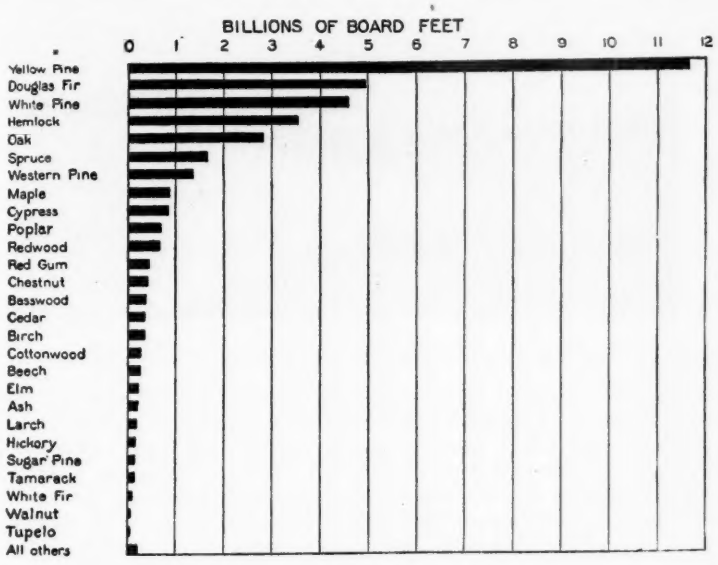
Another diagram shows the lumber cut by states in 1906. Washington produced 11.5 per cent. of the total, Louisiana 7.4 per cent., Wisconsin 6.2 per cent., and Michigan 5.6 per cent. The



Relative Lumber Production of Nine States in 1880 and 1906.

15 states which cut over one billion feet in 1906 supplied nearly three-fourths of the total production. Another diagram shows the proportion of the total lumber production from nine states in 1880 and in 1906. These nine states produced 52.8 of the total in 1880 and 51.5 in 1906. These proportions are about equal, but the changes in the output of individual states are very striking. Michigan, for instance, cut 23 per cent. of the total in 1880 and only 5.6 per cent. in 1906. Louisiana cut 0.7 per cent. of the total in 1880 and 7.4 per cent. in 1906. In 1880 Washington furnished only 0.9 per cent. of the lumber production of the country, but in 1906 it furnished 11.5 per cent. The cutting of the virgin timber in the North and East has been followed by greatly increased drains on the forest resources of the South and West.

The hardwood and softwood lumber production in 1906 is shown in another figure. The amount of softwood cut was over four



Forest Products in 1906.

times the amount of hardwood. There has been a decided change in the ratio between the two kinds in recent years. In 1889 hardwoods furnished nearly 25 per cent. of the total, against 19½ per cent. in 1906. There has been a greatly increased cut of certain softwoods. In the last seven years the cut of yellow pine has increased 20.7 per cent., western pine 46.9 per cent., cypress 69.3 per cent., redwood 83.2 per cent., and Douglas fir 186.2 per cent. These increases far more than counterbalance the decrease during the same period of 40.8 per cent. in the cut of white pine. On the other hand, the cut of oak has decreased 36.4 per cent., and of poplar 38.7 per cent. These are the two most important hardwoods.

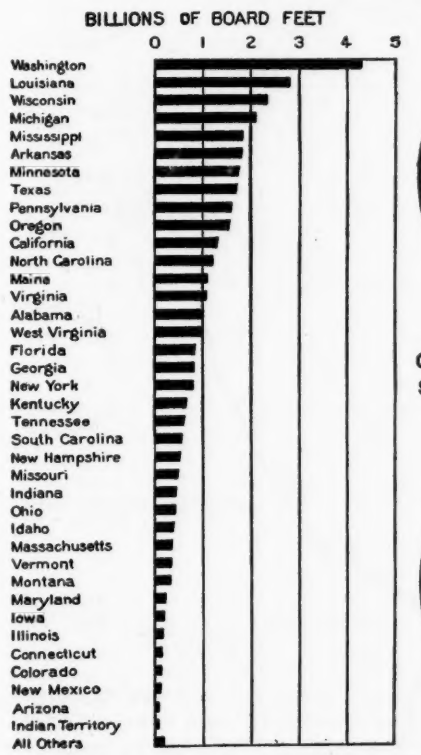
The total lumber production reported by the censuses of 1880, 1890, 1900 and 1906 is shown in another figure. The cut of lumber has more than doubled since 1880. The annual per capita consumption during the same period has increased from 360 board feet to 440 board feet. The rate of increase in lumber production has been small during the last few years, which probably indicates that the maximum cut for the country as a whole has been nearly if not quite reached.

The United States uses each year 100,000,000 cross ties, three-fourths of which are hewed. Sawed ties are included in the item of lumber mentioned in the second paragraph. Of the hewed cross ties, the oaks, and chiefly the white oaks, furnish nearly one-half. The cut of the hewed ties from young oak trees constitutes, with the exception of lumber, the most serious drain on the oak forests. Two-fifths as much oak timber is required for ties as for lumber. The southern pines furnish nearly 18 per cent. of the hewed cross ties, cedar about 8 per cent., and chestnut about 7 per cent. Other woods which are used in large quantities for hewed cross ties are cypress, tamarack, western pine and redwood.

The annual consumption of lumber in firewood is estimated at 50 billion board feet. Much timber is also destroyed or damaged by fires and storms. For example, in 1891 it is estimated that 12,000,000 acres of forest land were burnt. Again, in the fall of 1906 a great deal of timber was thrown down by wind in the Gulf states. The present consumption of wood in all forms may therefore be conservatively estimated as at least 100 billion board feet a year, and possibly much more. One leading authority has estimated that the total annual use of wood in the United States is equivalent to 150 billion board feet.

Only approximate answers can be given as to how long our timber supply will last at the present rate of cutting. The accompanying diagram shows the excess of the annual cutting over the annual forest growth in the United States as nearly as can be estimated. The annual cut is about three times as great as the annual growth. The most detailed estimates of the standing timber in the United States range from 1,400 to 2,000 billion feet. On this basis the exhaustion of our timber supply is indicated in from 9 to 33 years, according to the method of estimating. Yellow pine, the most important single kind of timber at present, will probably be exhausted in from 10 to 25 years, and Douglas fir in from 25 to 70 years, though this estimate for these woods disregards annual growth.

At present only about 22 per cent. of our total forest area, assuming a forest area of 700,000,000 acres, is in State or National Forests, the remainder being on unreserved public lands or in private hands. The forest area of the United States is amply sufficient, if rightly managed, to produce eventually enough timber to supply all our needs. Yet private owners, as well as the state and national governments, must use their forest lands in a right way if we are to maintain our timber supply.



Lumber Production by States in 1906.

Comparison of Hardwood and Softwood Production in 1906.

Excess of Annual Cut of Timber Over Annual Growth.

Foreign Railroad Notes.

Although there has been a decided check to the industrial activity of Germany, the railroad gross earnings are larger than last year; on the Prussian lines 7 per cent. larger in February.

By the electrification of the Giovi tunnel, a short distance north of Genoa, it is expected that 2,000 cars daily may be passed through, instead of 1,000, as at present. The improvement is to be completed early in June.

The degree of Doctor of Engineering was conferred by the Karlsruhe Technical School February 19 last, his 50th birthday, on Wilhelm Schmidt, in recognition of his merits in connection with the use of superheated steam in locomotives.

The production of cotton in the Russian dominions north of Afghanistan affords a considerable traffic to the Asiatic Midland (to the Caspian Sea) and the new Orenburg & Taskend line, and an appreciable contribution to the Russian cotton factories; though as yet not enough to make Georgia and Texas tremble. Up to the first of January last the shipments of last year's crop had amounted to 309,620 bales.

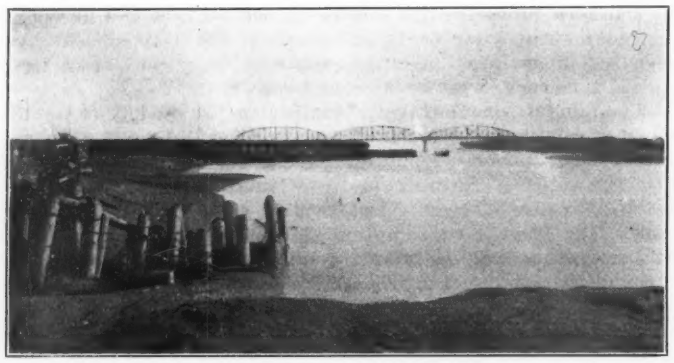
A railroad was recently built in Norway from Christiania westward over the mountains to Bergen, on the German ocean. This was snowed under so deep that the section over the mountains was closed in January, and not till April 6 was it attempted to dig it out, with a rotary snow plow. Several miles of snow sheds are to be built; but these will detract from the attractions of the journey.

In answer to a deputy who is an authority on German coal and iron traffic, and who had called attention to the advantages of cars of large capacity as used in America, the Prussian Minister of Public Works said that experience had shown that 20-ton (44,000

lbs.) cars were as large as could be used to advantage on their lines, and that self-unloading cars were economical only on short routes where they are discharged every day.

Repairing a Dike on the Southern Railway.

The "North Incline" of the Southern Railway leading to the freight car ferry on the Illinois side of the Mississippi river near Granite City—about half a mile north of the Merchants' bridge—handles as much if not more freight than any other incline in the vicinity of St. Louis. From the map shown herewith it will be seen that the incline trestle is double-track and is protected by three dikes, the largest and most important being the "north hurdle" dike. This was built in 1902-1903, a part of the work being done during the high water of the spring of the latter year when the stage of the river was about 25 ft. The current was so strong that it was impossible to sink matting to protect the piling against washing out. As a result, the floods of succeeding years cut the piling out until a gap of about 500 ft. had been made. This allowed the current to attack the incline, as shown by the river contours.

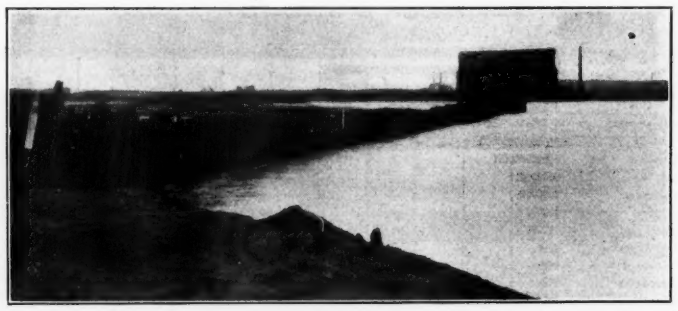


Dike Piles in Foreground Were Part of Original Structure.

It was decided, in repairing the dike, to build the new section at an angle that would deflect the direct current from Gaberet's slough, since during flood periods this current is very strong and difficult to break. The construction of the new work was favored by an extremely low stage of the river.

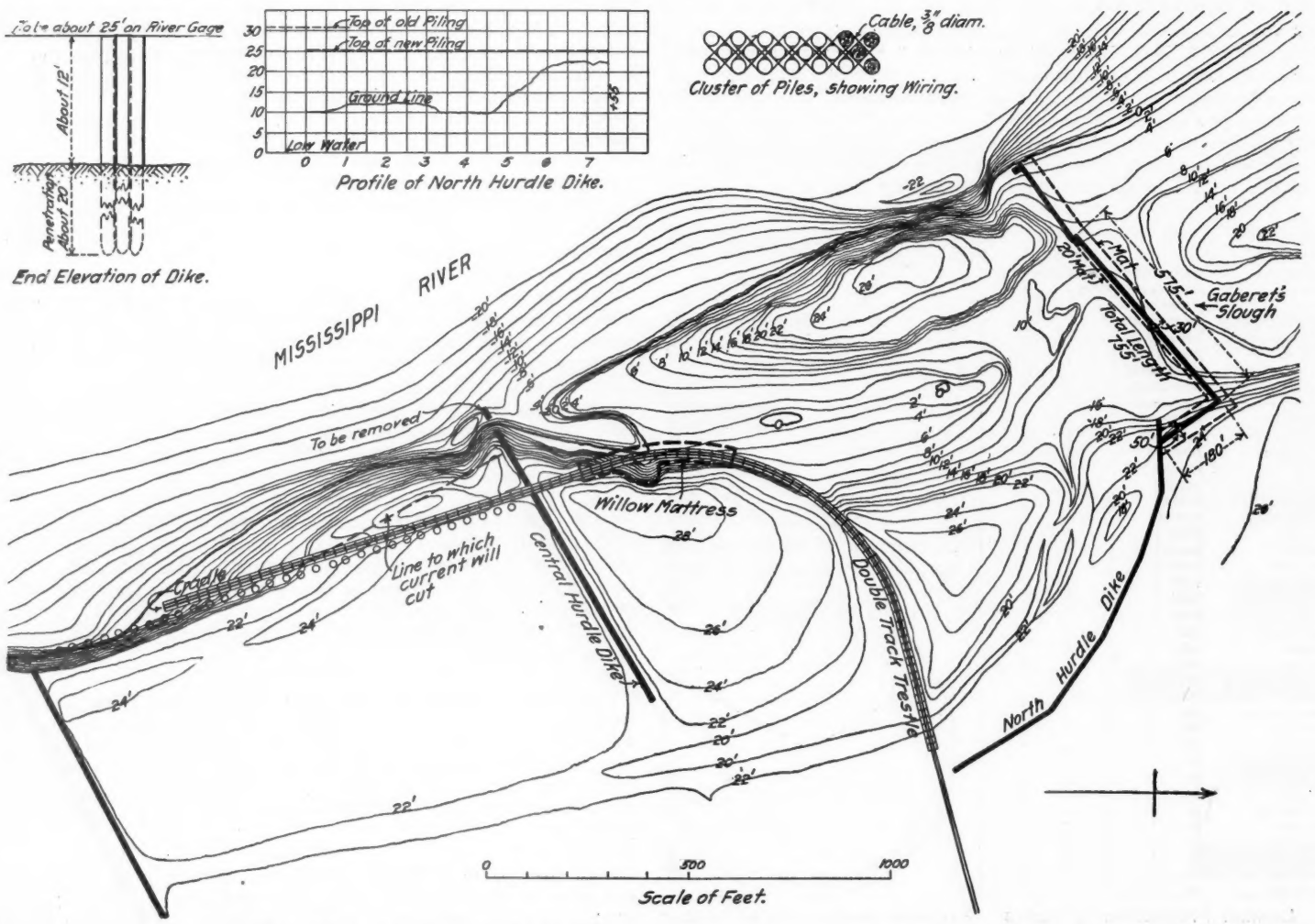
An excavation about 5 ft. deep and 50 ft. wide was made in the bed of the slough, which at this point is at an elevation of about 10 ft. Willow mattresses closely woven and wired were laid in this trench and covered with limestone riprap to the amount of about 1½ cu. yds. to each 100 sq. ft. of mattress. The up-stream side of the mattress was dipped about 2 ft. and heavily riprapped at the toe to prevent under-scour. The piling was then driven through the mattress about 20 ft. from the up-stream edge. The plan shows the spacing of the piling, which averages about two piles per lineal foot. These were carefully drawn into place and wired and stapled, and the tops of the piles cut off evenly. Theoretically, in one or two years' time all space between the dike and the trestle should be filled in with sand deposit to a contour of 18 to 20 ft., giving positive protection to the incline from floods.

It will be noticed that the outer end of the central dike is marked for removal. This dike now extends so far into the river as to keep the current too far away from the lower incline trestle, and sand banks form over the tracks during each high water, which have to be removed either by hand or hydraulic power. Cutting off about 50 ft. of the dike will allow the current to cut in close enough to the trestle to do away with this trouble. The presence of a mattress at the outer end of the trestle curve is indicated on the map. It was placed there at the time the dike was repaired to prevent erosion of the bed by the river current.



View of Dike Before Tops of Piles Were Cut Off.

The work took two pile drivers about 60 days. It was done by contract under the direction of Edward Gray, Engineer Maintenance of Way of the St. Louis-Louisville lines of the Southern.



Method of Repairing Hurdle Dikes at North Incline, East St. Louis; Southern Railway.

GENERAL NEWS SECTION

NOTES.

It is reported that the St. Louis & San Francisco will dispense with the services of train auditors.

The State Railroad Commission of Illinois has ordered sweeping reductions in switching charges at Chicago.

The New York Central has closed its telegraph school for the summer; this for the reason, it is stated, that the company now has a surplus of operators.

The Pittsburgh Traffic Club has passed resolutions complaining because the railroads are not so free as formerly in furnishing shippers with copies of all new freight tariffs.

At Columbus, Ohio, last week Judge Evans granted a temporary injunction against the enforcement on interstate shipments of the demurrage rules prescribed by the State Railroad Commission.

The Supreme Court of Texas has sustained the contracts, made before the passage of the present anti-pass law, under which the employees of express companies are carried free on railroads.

The newspapers say that there is to be a conference in Chicago, June 12, of members of the railroad commissions of six states—Illinois, Indiana, Wisconsin, Michigan, Ohio and New York, Second district.

Joseph Richardson, Chairman of the Southeastern Passenger Association, announces that after June 1 mileage books will not be accepted on trains but must be presented at the ticket offices for exchange.

The Wabash has issued freight tariffs at Chicago in which the rates, while no higher than before, include the charges for carrying freight in the tunnels from the shippers' stores to the Wabash freight houses.

The Massachusetts legislative committee on railroads and taxation, sitting jointly, has voted to report the bill based upon the petition of John P. Wainright, and advocated by President Tuttle of the Boston & Maine, to amend the Massachusetts anti-stock watering laws with regard to the issuing of new stock by steam railroads and street railways.

It is announced that beginning May 31, through passenger trains are to be run between Chicago and Savannah over the Illinois Central and the Central of Georgia. The route will be over the Illinois Central's main line to Jackson, Tenn.; from there to Birmingham, Ala., over the new line of the Illinois Central and from Birmingham to Savannah over the Central of Georgia.

Railroad Club of New York.

This is the name of a new social club which has just been opened in the "down town" section of New York City. It is in one of the two new Hudson Terminal buildings. At the dedication on Monday last about 1,000 members and guests were present. The rooms are in the twenty-first and twenty-second stories of the building named, which is at the corner of Church and Cortlandt streets. The club's officers are E. H. Gary, of the United States Steel Corporation, President; F. D. Underwood, President of the Erie Railroad, Vice-President, and C. W. King, Secretary and Treasurer. The house committee is composed of W. G. McAdoo, W. G. Oakman, W. H. Marshal, F. B. Jennings and W. G. Besler.

Entering the foyer on the twenty-first floor, one passes directly to the office, which is flanked by a broad staircase leading to the floor above. Off the foyer to the north are the smoking or lounging rooms and the grill, and in the southwest corner the main dining room for men. Along the east side of the building on this floor are 10 private dining rooms. It is possible here to open sliding doors, throwing five of these rooms into one long banquet hall. The floor above has a ladies' dining room and a roof garden.

The Chicago Subway.

The lines of the underground electric freight railroad in Chicago now connect with the freight station of every railroad in the city except one, and with 34 large stores, warehouses, etc. The company has just completed a freight station at 169 West Jackson boulevard and one at Dearborn avenue and North Water street, for the accommodation of merchants whose buildings cannot profitably be connected directly, through their basements, with the railroad tunnels. From an article in the *Western Electrician* it appears that the tunnel roads now have 1,800 cars and 130 electric locomotives. The speed of trains is limited to 15 miles an hour. It has been found desirable to have signals of some kind at the numerous intersections of north and south with east and west lines, and an automatic arrangement is being put in, to be actuated through the trolley wire. With this a red light is shown at a crossing when a train is approaching. At the 13 places where the lines run beneath rivers, a similar connection to the trolley wire is to be made to provide an automatic block system for trains following one or another on the steep grades. These grades under the river are from 80 ft. to 160 ft. per mile. The officers of the Illinois Tunnel Co. are Samuel McRoberts, President; A. J. Earling, Chairman of the Executive Committee; W. J. C. Kenyon, General Manager, and J. W. Callahan, General Superintendent.

Scherzer Bridge in Egypt.

The contract for the bridge over the Nile at Cairo, costing over $1,500,000, has been given to the Compagnie de Fives-Lille, of France. The bridge will be about 900 ft. long between abutments, and will carry a road, two footpaths and a double-track electric railway. There will be one draw span, consisting of a Scherzer double-leaf, rolling lift bridge, 129 ft. 4 in., center to center of pins, and 63 ft. wide. The bridge will be built according to plans prepared by the late Sir Benjamin Baker, one of the designers of the Forth bridge in Scotland, and the Scherzer Rolling Lift Bridge Co., Chicago, which company will act as Consulting Engineers for the draw span and adjacent parts. It is expected that the bridge will be in service before the end of 1910.

Steel Fence Posts.

The standard steel post made by J. H. Downs, 299 Broadway, New York, is made of a single high carbon steel angle. It is driven into the ground, thus saving the expense of digging post holes. To hold it more firmly in place, a vitrified clay collar, fitting loosely on the post, is slid down it after the post is driven, leaving about 1 in. of the collar above ground. The posts are made in various lengths, and in sizes from 1½ in. x 1½ in. x $\frac{3}{16}$ in. to 2 in. x 2 in. x $\frac{5}{16}$ in. The fence wire is attached to the posts by special staples engaging the wire and then driven into holes punched through the post and clinched on the inside. Instead of staples, clips which grip the post may be used. This is a convenience when it is not known in advance what fencing will be used, so that the posts cannot be punched accordingly. A special non-climable fence post is furnished for use with barb wire, the top of the fence being bent inward at an angle of 45 deg.

Williamsburgh Bridge Terminal.

The new subway station under construction for the past two years at the Manhattan end of the Williamsburg bridge, New York City, has been opened for business. The station is used by the electric (surface) street cars which cross the bridge to and from Brooklyn. The new terminal station has eight loops, with separate platforms, and entrances and exits for each loop, so that the streams of incoming and outgoing passengers will not get in each other's way.

In Brooklyn a connection is being made between the Broadway elevated road and the bridge, and it is expected that elevated cars will soon be run over the bridge.

The Amsterdam Corporation.

The Amsterdam Corporation, 165 Broadway, New York, has been organized for the purpose of acting as engineer on special railroad problems, such as electrification of steam lines; subaqueous tunnels; urban and interurban railways; passenger and freight terminals, and analyses of operating contracts. While the principal purpose is to give advice on these matters, the corporation is prepared, when desired, to act as agent for the principal in supervising and directing new construction to a conclusion. With this object in view, no alliance or connection has been nor will be made by the corporation, or its officers or employees, with any manufacturing company or others, that will interfere with unbiased and disinterested devotion to the interests of its clients.

The corporation is also prepared to initiate and perfect plans for new enterprises, accompanied by data that will demonstrate their merit to investors. The President, William J. Wilgus, was

formerly vice-president of the New York Central. The Vice-President, Henry J. Pierce, is president of the International Railway, Buffalo, and president of the Netherlands Tramways Corporation.

Crop Conditions on May 1, 1908.

The crop reporting board of the Bureau of Statistics of the United States Department of Agriculture finds, from the reports of correspondents and agents of the bureau, that the area of winter wheat standing on May 1 to be harvested was about 29,751,000 acres, which is 4.2 per cent., or 1,318,000 acres, less than the area reported as sown last fall and 5.8 per cent., or 1,619,000 acres, more than the area of winter wheat harvested last year.

Winter wheat.—The average condition of the growing winter wheat on May 1 was 89.0 per cent. of a normal, as compared with 91.3 on April 1, 82.9 per cent. on May 1, 1907, and 85.8 per cent. the mean of the May 1 averages of the past 10 years.

Rye.—The average condition of the rye crop on May 1 was 90.3 per cent. of a normal, as compared with 89.1 on April 1, 88.0 on May 1, 1907, and 89.5 the mean of the May 1 averages of the past 10 years.

Meadows.—The average condition of meadow (hay) lands on May 1 was 93.5 per cent. of a normal, as compared with 83.6 on May 1, 1907, and 89.5 the mean of the averages on May 1 of the past 10 years.

Pastures.—The average condition of pastures on May 1 was 92.6 per cent. of a normal, as compared with 79.6 on May 1, 1907, and 87.8 the mean of the averages on May 1 of the past 10 years.

Spring plowing.—Of the total acreage of spring plowing contemplated, 66.6 per cent. is reported as actually done up to May 1, as compared with 71.5 per cent. at the corresponding date last year, and 65.9 the mean of the averages so reported in the past 10 years.

Spring planting.—Of spring planting 54.7 per cent. is reported as having been completed on May 1, as compared with 47.0 per cent. on May 1, 1907, and 52.6 per cent. on May 1, 1906.

Increase in Stockholders.

Since the panic of last year the number of stockholders of the principal railroads in the United States has increased greatly. A considerable part of this increase may be due to the registration of shares in the names of the individuals instead of in the names of brokerage firms, but it is also due to increased investment by people who were attracted by the relatively low price of railroad stock during and after the panic.

The following table compiled by the *Wall Street Journal* gives the approximate number of shareholders of certain corporations at present, compared with certain dates previous to the panic in October:

Company.	Shareholders—Now.	Shareholders—Before panic.
U. S. Steel	95,000	68,000
New York Central	22,098	16,445
Big Four	1,650	1,277
Nickel Plate	807	630
Standard Oil	5,456	5,087
Rock Island preferred	3,020	2,295
Rock Island common	4,105	3,049
Chesapeake & Ohio	2,648	1,735
Norfolk & Western	4,530	3,679
Erie	10,050	9,258
Chicago Great Western	10,500	9,000
Chicago, Milwaukee & St. Paul	10,000	6,000
New York Air Brake	1,200	800
Atchison	25,000	19,700
Delaware & Hudson	5,861	3,700
Canadian Pacific	18,943	15,900

Sale of Passenger Coaches.

The Commissioner of Bridges will sell at public auction June 2, 1908, in Brooklyn, N. Y., 92 passenger coaches, 20 of which are motor cars weighing about 36 tons each, as noted on advertising page 22 of this issue.

Limit of New Security Issues in New York.

The Public Service Commission of Albany, in granting authority to the Lehigh & Hudson River Railway to issue only $270,000 bonds on its application for permission to issue $300,000, decides that bonds or stocks cannot be issued to repay money taken from the treasury, although this money may have been used for work properly chargeable to capital account. The Commission points out that the only thing that can be considered is the new use of the money acquired from the sale of bonds or stock. (See discussion on editorial page.)

A North Western Menu Card in Japanese.

A facsimile of a menu card prepared by the Chicago & North Western Ry. for a party of Japanese merchants, manufacturers, bankers and newspaper men which traveled over that road in April is shown herewith. The party was on a sight-seeing trip around the world. They traveled eastward from San Francisco on the Overland Limited. When nearing Chicago their sleeping cars and special dining car were detached and run as a special train to enable the visitors to examine such industries on the North Western as interested them. The special menu card was bound in a cover bearing the crossed flags of Japan and the United States.

朝 食

ストロベリー. ウイズ. クリーム

菊 筍

ロールド. オーツ　　ビスケツト

フライド. ブラック. バス

サラトガ. チップス

ブロイルド. スプリング. ラム. チョップ

ブロイルド. スクワブ. チキン

ハム. オー. ベーコン 付 フライ. エッグス

スクランブルド. エッグス

オムレット. プレーン. オー. パースレー

ベーキド. ポテトー　　フライ. ポテトー

エッグス (注文)

ブレックファスト. ロール

トースト.　　コーン. ブレッド

珈琲　　ココア

牛乳

BREAKFAST

FRESH STRAWBERRIES WITH CREAM

GRAPE FRUIT

ROLLED OATS

SHREDDED WHEAT BISCUIT

FRIED BLACK BASS
SARATOGA CHIPS

BROILED SPRING LAMB CHOPS

BROILED SQUAB CHICKEN

HAM OR BACON WITH FRIED OR SCRAMBLED EGGS

PLAIN OR PARSLEY OMELET

BAKED AND FRENCH FRIED POTATOES

EGGS AS ORDERED

BREAKFAST ROLLS　　CORN BREAD

TOAST

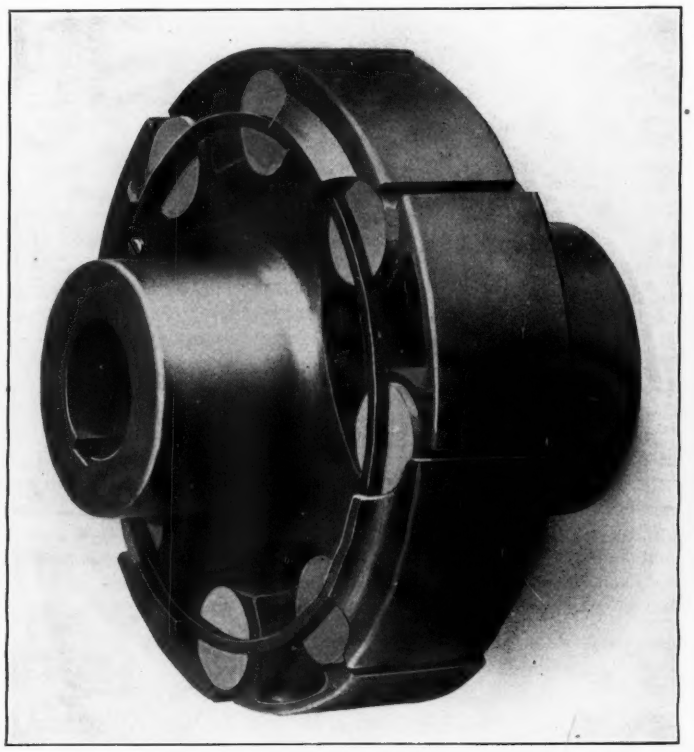
COFFEE　　COCOA

MILK

North Western Menu Card in Japanese.

A New Flexible Insulated Coupling.

The illustration shows an improved flexible insulated coupling manufactured by the R. D. Nuttall Co., Pittsburgh, Pa. The coupling consists of two interlocking spiders of cast-iron, insulated by solid rubber cylinders. The only other parts are two steel rings used to hold the rubber cylinders in position. The rubber members provide ample insulation and at the same time give the desired flexibility. It is furnished in sizes from 5 h.p. up.



Nuttall Flexible Insulated Coupling.

This coupling is especially desirable where electric motors are

direct-connected to machinery subject to vibration; for example, a tube mill or a coal pulverizer in a cement plant, where the coupling relieves the motor from the shocks and jars of the machine. In addition, the end thrust of the crusher is overcome and the motor bearings run without heating.

Arthur Koppel.

Arthur Koppel, who died suddenly on May 13, at Baden Baden, Germany, was born in Dresden, Germany, in 1851, and started in business when he was 17 years old. He was first interested in a concern in the handling of structural iron and established his own firm in 1876, taking up the problem of making portable all kinds of material for narrow-gage railroads. In 1905 the firm was made a stock company. The American business, the Arthur Koppel Co., Pittsburgh, Pa., was established ten years ago. There will be no change in the company.

Davidson Locomotive and Car Raiser.

The accompanying illustration shows the Davidson locomotive and car raiser in position. This device is a practical emergency

Davidson Locomotive and Car Raiser.

jack, upon which the wheel of the locomotive or car is run and allowed to rest in the curve shown. In cases of failure in a locomotive equalizer system, the raiser, used under the wheel, lifts the engine frame into a position when temporary repairs can be made. The raiser is made of cast steel and will handle locomotives of any size. It is made by the U. S. Metal & Manufacturing Co., New York.

University of Illinois.

Prof. Ira O. Baker, for 34 years connected with the Department of Civil Engineering of the University of Illinois, has been granted by the trustees leave of absence for one year from July 1, 1908. It is understood that Professor Baker will devote his time to revising his book on Masonry Construction. The executive duties of the Department of Civil Engineering will, during his absence, be assumed by Prof. J. P. Brooks.

INTERSTATE COMMERCE COMMISSION RULINGS.

Relation of a Particular Rate to Rates Generally.

George R. Reynolds v. Southern Express Co. Opinion by Commissioner Clements.

The defendant's rate on cream of $3.90 per 10 gallons from Columbia, Tenn., to Jacksonville, Fla., was held to be unreasonable, and a rate not exceeding $2.75 for the movement of the cream and the return movement of the empties was prescribed. The law requires that the several classes of common carriers subject to its provisions shall fix reasonable charges for transportation, and the authority of the Commission to prescribe a reasonable rate is not restricted by the terms of any agreement between an express company and a railroad company. It is not sufficient, says the commission, for a carrier when called upon to justify a rate to assert that its rates generally are fair and just and that no change may properly be made in any particular rate because it would disturb the integrity of the system as a whole. In dealing with a particular rate the commission may consider such other rates as affording a basis for comparison, but where a given rate is found to be unreasonable the commission will not hesitate to order such rate reduced, although the reduction might disarrange the relative adjustment existing between this and other rates.

TRADE CATALOGUES.

Light Locomotives.—The H. K. Porter Co., Pittsburgh, Pa., has issued the tenth edition of its catalogue of light locomotives. The volume contains 224 pages bound in cloth and describes 559 locomotives, covering a wide range of sizes and designs up to engines of 17-in. cylinders. Attention is called to the fact that during the interval since the publication of the ninth-edition catalogue, there has been an increase in power and efficiency and in the quality of the locomotives greater than during any similar period in the history of the company. The catalogue also gives a large amount of engineering data concerning locomotive performance and track work.

Idaho & Washington Northern.—A folder describing the country through which this road runs is illustrated with striking photographs of standing timber and scenery along the Pend d'Oreille river, on which a line of steamers is operated in connection with the railroad. It also calls attention to the silver-lead mines, lumbering and farming opportunities and fishing and hunting. Other photographs show the solid vestibuled passenger trains of Pullman coaches operated by the road.

Electric Headlights.—Under the title "Two Aids to Better Service," the General Electric Co., Schenectady, N. Y., has issued a neat folder, No. 3,654, calling attention to some of the reasons why the G E Luminous Arc headlight has been adopted. On the front page are pictures of the headlight and the Belmont tunnel, New York, the "Two Aids." A list of a few of the roads now using the light is included.

Locomotive Raiser; Locked Clevis.—The U. S. Metal & Manufacturing Co., New York, has published a leaflet describing the Davidson locomotive raiser. Another leaflet describes the Hillman locked clevis and turnbuckle, reference to which was made in the *Railroad Gazette* of Feb. 7, 1908.

Derails.—Catalogue No. 51, of the Hayes Track Appliance Co., Geneva, N. Y., is a full catalogue of Hayes derails. The different styles are described and illustrated by photographs and drawings, and plans are also shown for operating the derails by pipe line from main track switch stands. Rules for installing and maintaining the devices are included.

Tanks.—The W. E. Caldwell Co., Louisville, Ky., recently issued the twentieth annual edition of its catalogue. The pamphlet contains 36 pages of useful information regarding tanks which have been installed and built by the company; these include both wooden and metal tanks of various designs, as used by railroads and manufacturing plants.

Industrial Railways.—Pamphlet No. 077 of the C. W. Hunt Co., West New Brighton, Staten Island, N. Y., briefly describes and illustrates industrial railways and rolling equipment for them, including many styles of cars and electric storage battery locomotives. References are given to other catalogues describing the company's products in more detail.

Jacks, Tool Grinders, Track Drills and Brake-Beam Clamps.—Topping Brothers, New York, have issued a pamphlet describing Burrows ball bearing jacks. These are made in 25 styles, in sizes from 15 tons to 50 tons. The Lightning tool grinder, the Lightning track drill and the Totten brake-beam clamps are also described and illustrated.

Signal Supplies.—Catalogue No. 13 of the Bryant Zinc Co., Chicago, has 160 pages and is bound in cloth. The products described and illustrated include battery materials, crossing signals and bells, relays, battery chutes, wire, track drills and other supplies and tools for the signal department.

Denver & Rio Grande.—The passenger department is sending out a circular, No. 55, giving a list of hotels and boarding houses on the lines of the Denver & Rio Grande, the Rio Grande Western and the Rio Grande Southern. Location, rates, capacity and similar information are given.

Pump Valves.—A circular which is being distributed by Jenkins Brothers, New York, calls attention to pump valves made of various compounds suited to water at different temperatures and pressures, as well as other liquids and also to air compressors.

Weatherproofing.—A circular issued by the H. W. Johns-Manville Co., New York, describes Keystone hair insulator, showing its application for sound deadening and weatherproofing.

MANUFACTURING AND BUSINESS.

The Chicago store of Jenkins Bros., New York, has been moved to larger quarters at 226-228 Lake street, corner of Franklin street.

Jerome & Elliott, Chicago, makers of Jerome metallic packing, have moved to 351 and 353 West Monroe street into larger quarters.

W. R. Toppan, for many years General Manager of the Kennicott Water Softener Co., Chicago, has resigned. His present address is Chicago Athletic Association.

Herbert C. Petty has been elected a Director of the Crocker-Wheeler Co., Ampere, N. J. Mr. Petty entered the sales department of the company in 1903, and is now Contract Manager.

David Newhall has been appointed manager of the department of supplies for railroads, manufacturers and contractors of the George M. Newhall Engineering Co., Ltd., 136 South Fourth street, Philadelphia, Pa.

William A. Pitcher, for two years the Eastern railroad representative of S. F. Bowser & Co., Fort Wayne, Ind., was one of the 12 who lost their lives in the burning of the Aveline Hotel in Fort Wayne on May 3. Mr. Pitcher was 48 years old.

The General Railway Signal Co., Rochester, N. Y., recently closed a contract with the Northern Pacific Railroad Co. for two electric interlocking plants at Duluth, Minn. These plants are for interlocking at two drawbridges about 2,200 ft. apart, and electric locking is provided between the towers.

The U. S. Metal & Manufacturing Co., New York, has just completed arrangements with the United Railroad Equipment Co., Baltimore, Md., by which it becomes the sole selling agent in the United States for the I. X. L. automatic track sander. Among the roads having engines equipped with this sander are the Philadelphia & Reading and the Central of Georgia.

The American Blower Co., Detroit, Mich., has bought the foundry of the Northwestern Foundry & Supply Co., Detroit, maker of cast iron soil pipe and fittings and plumbers' specialties. The foundry will be used for making blower, exhaust fan, engine and heater castings, and it is desired to dispose of all soil pipe fitting patterns and foundry equipment complete; also a large stock of finished pipe fittings, bell traps and other material.

George E. Pratt, formerly sales representative of the Hicks Locomotive and Car Works, Chicago, has been elected President of the H. A. Clark Co., New York, dealer in passenger and freight cars and car specialties and Sales Agent for the Middletown Car Works, Middletown, Pa. Mr. Pratt is also Vice-President and General Manager of the Central Inspection Bureau, 17 State street, New York, inspector of railroad equipment, iron and steel, bridge materials and kindred lines.

The C. I. F. Company, 11 Broadway, New York, takes its name from the three terms, cost, insurance and freight, used in the export trade. The method of the company, which acts as export commission merchant of machinery, tools, etc., is to simplify the complicated system of discounts and other factors entering into selling prices which often prevent foreign buyers from ordering from American firms. The C. I. F. Company puts before the prospective buyer in a standard form the actual net prices of the articles it deals in and also distributes easily understood indexes of these articles. These are published in English, French, German and Spanish.

OBITUARY NOTICES.

William J. Murphy, Vice-President of the Cincinnati, New Orleans & Texas Pacific, and Third Vice-President of the Alabama Great Southern, died at his home in Cincinnati, Ohio, on May 10. He was born in 1848, at Greenfield, Mass., and entered railroad service on the Erie, in 1862, as messenger in the telegraph office at Susquehanna, Pa. Two years later he became telegraph operator and ticket clerk at Deposit, N. Y., and the next year he was made train flagman, station agent and yardmaster at the same place. In 1866 he was transferred to the train despatcher's office, and in 1870 became train despatcher on the Delaware division. Three years later he was promoted to chief train despatcher of the same division, and in August, 1882, was made Superintendent. In 1887 he was promoted to General Superintendent. During 1890 he was out of railroad service, but in the next year he became Superintendent of the Brunswick division of the East Tennessee, Virginia & Georgia, now part of the Southern. In 1893 he went to the Cincinnati, New Orleans & Texas Pacific as Superintendent of the Cincinnati division, and in 1899 was appointed General Manager. On April 30, 1903, he was elected Vice-President of this road, and Third Vice-President of the Alabama Great Southern.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Brotherhood of Freight and Baggage Men.

This brotherhood held its third biennial convention at Lancaster, Pa., May 12, about 200 members being present.

American Society of Civil Engineers.

At a meeting of this Society, May 20, a paper on the "Effect of Temperature Changes on Masonry," by Charles S. Gowen, was presented for discussion. This paper was printed in the proceedings for April, 1908.

Canadian Railway Club.

This club has elected officers: President, L. R. Johnson, Canadian Pacific; Vice-President, H. H. Vaughan, Canadian Pacific; Second Vice-President, A. A. Mayer; Secretary, James Powell; Treasurer, S. S. Underwood.

The Franklin Institute.

At a stated meeting of the Institute, May 20, there was an address by Dr. Geo. Flowers Stradling, of Philadelphia, Pa., on "John Fitch, Pennsylvanian, Inventor of the Steamboat." The address was supplemented with illustrations.

International Brotherhood of Railway Employees.

This association met at Boston May 12, 120 delegates being present. The President of the association in his report said that the Canadian Government (operating the Intercolonial Railway) had agreed to recognize the union.

Railroad Special Agents.

The Railway Association of Special Agents and Police, of the United States and Canada, held its twelfth annual meeting at Lexington, Ky., May 11, about 150 members being present. The meeting was presided over by W. F. Riley, of Chicago, President of the association.

American Society of Mechanical Engineers.

At the semi-annual meeting of this society to be held in Detroit, Mich., June 23-26, an entire session will be devoted to the discussion of papers on the conveying of materials and hoisting and conveying machinery, including belt conveyors. At this meeting there will be a continuation of the paper on "Clutches," with special reference to automobile clutches, by Henry Souther, from the meeting of May 12. The other papers are as follows: "Some Pitot's Tube Studies," by W. B. Gregory and E. W. Schroder; "Thermal Properties of Superheated Steam," by R. C. H. Heck; "Horse Power, Friction Losses and Efficiencies of Gas and Oil Engines," by L. S. Marks; "A Journal Friction Measuring Machine," by Henry Hess; "A Simple Method of Cleaning Gas Conduits," by W. D. Mount; "A Rational Method of Checking Conical Pistons for Stress," by G. H. Shepard, and "The By-Product Coke Oven," by W. H. Blauvelt. There will be the usual excursions to points of interest in and around Detroit, including a visit to the University of Michigan, at Ann Arbor. The Society for the Promotion of Engineering Education and the Society of Automobile Engineers will hold a meeting in Detroit at the same time.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Indiana Harbor Belt.—R. M. Huddlestone, Auditor of the Lake Shore & Michigan Southern, has been appointed also Auditor of the Indiana Harbor Belt, succeeding John Stewart, resigned.

Lake Shore & Michigan Southern.—See Indiana Harbor Belt.

Operating Officers.

Chicago & Alton.—F. C. Runnels has been appointed Trainmaster at Dwight, Ill., succeeding C. F. Smith, transferred.

Delaware, Lackawanna & Western.—C. C. Foltz has been appointed Assistant Superintendent at Hoboken, N. J., succeeding J. G. Sickles, resigned.

F. W. Bennings, chief train despatcher, has been appointed Passenger Trainmaster at Hoboken, N. J., succeeding Frank Cizek, transferred.

El Paso & Southwestern.—S. R. Kennedy has been appointed Trainmaster at Tucumcari, N. Mex., succeeding H. H. White.

Mexican Central.—C. W. Everett has been appointed Assistant to the General Manager, with office at Mexico City.

C. E. Carson has been appointed Superintendent of Terminals at Tampico, Tam., succeeding J. J. Lewis, resigned.

Traffic Officers.

Chicago, Burlington & Quincy.—Mark Ford, Foreign Freight Agent in Chicago, has been appointed Texas Freight and Passenger Agent, with office at Dallas, Texas, succeeding C. W. Andrews, resigned. The position of Foreign Freight Agent in Chicago has been abolished.

Grand Trunk Pacific.—J. E. Dalrymple, the new Assistant Freight Traffic Manager, was born in 1869 in Montreal, Quebec, and began railroad work in 1883 in the Treasurer's office of the Grand Trunk. In 1890 he was made secretary to the Traffic Manager of the Chicago & Grand Trunk, now the Grand Trunk Western. Six years later he became secretary to the General Traffic Manager of the Grand Trunk and was made division freight agent at Hamilton, Ont., in 1899. Later in the same year he was transferred to Detroit, Mich., and was also made Manager of the Grand Trunk Despatch Fast Freight Line. In 1900 he went to the Central Vermont as General Freight Agent, but the next year went back to the Grand Trunk as Assistant to the Second Vice-President and General Manager. In 1902, he again became General Freight Agent of the Central Vermont, where he stayed until August 14, 1905, when he was appointed General Freight Agent of the Grand Trunk. He remained in this position until his appointment on May 1 of this year as Assistant Freight Traffic Manager.

J. E. Dalrymple.

Iowa Central.—E. B. Johns, soliciting agent of the Piedmont Air Line, has been appointed General Eastern Agent of the Iowa Central, with office at New York, succeeding A. W. Osborn, resigned.

Southern Pacific.—M. O. Bicknell, district freight and passenger agent, has been appointed Assistant General Freight and Passenger Agent at Tucson, Ariz., with jurisdiction over the lines in Arizona and New Mexico, and his former office has been abolished.

Engineering and Rolling Stock Officers.

Arkansas, Louisiana & Gulf.—J. M. Marshall has been appointed Superintendent of Bridges and Buildings, with headquarters at Monroe, La.

Chicago, Milwaukee & St. Paul.—P. C. Hart, until recently Superintendent of Terminals at Chicago, is now on construction work on the Pacific extension, under the direction of the Chief Engineer of the C., M. & St. P. of Washington.

Lehigh Valley.—E. B. Ashby, Engineer of Maintenance of Way, has been appointed Chief Engineer, with office at New York, succeeding W. G. Berg, deceased.

Mexican Railway.—C. H. Burke, Assistant Superintendent of Machinery, at Aguascalientes, Aguas., has been appointed Locomotive Superintendent at Orizaba, Vera Cruz, succeeding W. Cockfield, resigned.

Illinois Central.—J. G. Neuffer, the new Superintendent of Machinery, was born in February, 1854, at Chillicothe, Ohio, and began railroad work in 1869 as machinist's apprentice on the Marietta & Cincinnati, now part of the Baltimore & Ohio Southwestern. He served as machinist, fireman, engineer and shop-foreman on the same road, and in March, 1890, was made road foreman of engines on the Baltimore & Ohio Southwestern. Two years later he was appointed Master Mechanic on the same road and from December, 1893, to November 1, 1903, he was General Master Mechanic and Superintendent of Motive Power. In November, 1903, he resigned from the Baltimore & Ohio Southwestern to become Assistant Superintendent of Machinery of the Illinois Central. He held this office until his recent appointment to the office of Superintendent of Machinery.

J. G. Neuffer.

LOCOMOTIVE BUILDING.

The Iowa Central has ordered six mogul locomotives from the Baldwin Locomotive Works.

CAR BUILDING.

The Bloomington, Pontiac & Joliet Electric is in the market for three interurban cars.

The Chicago Railways have increased their order from the Pullman Co. from 300 to 500 cars.

The International & Great Northern is in the market for 1,250 cars instead of 750, 500 of which are box cars.

RAILROAD STRUCTURES.

CHICAGO, ILL.—The Illinois Central, it is said, will build a bridge over the tracks of the New York, Chicago & St. Louis.

The Chicago, Indianapolis & Louisville, it is said, is in the market for bridges. The Chicago, Burlington & Quincy will soon give contracts for bridge material.

FORT WILLIAM, ONT.—By an order of the Canadian Railway Commission, the Grand Trunk Pacific will have trackage rights over the Canadian Pacific from Port Arthur to Fort William, and a union passenger station will probably be built for the joint use of the Canadian Pacific, the Grand Trunk Pacific and the Canadian Northern.

VERA CRUZ, MEXICO.—Contract is reported let by the Vera Cruz Terminal Company for the extensive terminal improvements to be made here to S. Pearson & Son, who have an office at Mexico City. Work is to be started at once. (April 17, p. 559.)

WOODSTOCK, ONT.—The Canadian Pacific has given a contract to Power & Brewer for concrete work on its proposed bridge at Upper Woodstock. The value of the contract is about $125,000.

Contract is also reported let to Power & Brewer, by the Grand Trunk Pacific at about $350,000 for concrete work involving 75,000 cu. yds. of concrete.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

BUFFALO, ROCHESTER & PITTSBURGH.—Revision work, it is said, has been resumed on the 10-mile section of this road from Carmen, Pa., south to Brockwayville. The improvements include a double-track tunnel 1,000 ft. long and a new trestle. Contract for grading work let last year to Eyre-Shoemaker & Co., of Philadelphia. (March 13, p. 390.)

CANADIAN PACIFIC.—This company, it is said, will improve its

line between Calgary, Alb., and Strathcona at a cost of about $50,000.

Chicago, Lake Shore & South Bend (Electric).—This company, which is building an electric line from South Bend, Ind., west to Chicago, Ill., 71 miles, will begin operating the section from South Bend to Michigan City, June 1. It is expected that the entire line will be in operation by July. (April 17, p. 559.)

Illinois Central.—On the Natchez division of the Yazoo & Mississippi Valley new 75-lb. rails and new ties have been laid from Natchez, Miss., southwest to Harrison, 28 miles. Work is to be pushed on the remaining 70 miles southwest to Jackson.

Joplin & Pittsburg (Electric).—This company is said to be asking bids for track laying, bonding and ballasting about 25 miles of the line it is building from Joplin, Mo., northwest to Pittsburg, Kan. (March 13, p. 391.)

Missouri & North Arkansas.—This company, which recently began operating its extension from Seligman, Mo., northwest to Neosho, 41 miles, will shortly begin running trains through to Joplin, 19 miles north of Neosho, over the tracks of the Kansas City Southern.

Announcement is reported made that this company will build a branch from Negrohill, Ark., southwest to Little Rock, about 55 miles. Negrohill is on the extension of the main line under construction southeast towards Helena, on the Mississippi river.

New York & Long Island.—See this road under Railroad Corporation News.

Northwestern Railroad.—See Oregon Short Line.

Oregon Short Line.—Work, it is said, has been resumed by this company on the Northwestern Railroad. The Northwestern was organized to build from Huntington, Ore., north along the Oregon-Idaho state line, following the Snake river, to Lewiston, Idaho. (March 13, p. 394.)

Rochester-Corning-Elmira Traction.—The New York Public Service Commission, Second district, has authorized this company to give a mortgage to pay for the building and equpment of its proposed double-track electric line. The company was organized in 1906 to build from Rochester, N. Y., south to Elmira, 120 miles. The directors include C. O. Geer, G. Abeel, M. H. Schultze, F. Eckstein and T .S. Breckinham The office of the company is at 42 Broadway, New York.

Saratoga & Encampment.—Work, it is said, has been resumed by this company on the extension from Walcott, Wyo., south to Encampment, 45 miles. Track has been laid on all but about 12 miles, and it is expected to have the entire line in operation this month. (March 13, p. 394.)

South Dakota Central.—This company, it is said, has placed in operation its extension recently finished from Hayti, S. Dak., north to Watertown, about 18 miles. (Feb. 14, p. 234.)

Southern Railway.—See this company under Railroad Corporation News.

South Omaha & Western.—See Union Pacific.

Union Pacific.—The South Omaha & Western, it is said, has finished the new double-track line from South Omaha, Neb., to Lane, 11.60 miles, and the line is now in operation. (March 13, p. 395.)

Yazoo & Mississippi Valley.—See Illinois Central.

RAILROAD CORPORATION NEWS.

Chicago & Alton.—This road, together with the Toledo, St. Louis & Western, has secured trackage rights from the Baltimore & Ohio Southwestern, which gives a connecting link for through freight trains between Springfield, Ill., and Cowden.

Chicago & Eastern Illinois.—William Salomon & Co., of New York, are offering Chicago & Eastern Illinois equipment trust 5 per cent. notes of Oct. 1, 1907, and due $124,000 semi-annually, Oct. 1, 1908, to Oct. 1, 1917, inclusive. The authorized amount of the notes is $2,480,000, of which there are $2,356,000 outstanding. The maturities after 1910 are being offered at prices to yield 5½ per cent., and the earlier maturities to yield from 3½ to 5¼ per cent. The issue is secured on 2,000 steel frame cars costing $2,737,912, equal to 16 per cent. margin on the outstanding notes.

Calumet & South Chicago (Electric).—This company has taken over the Calumet Electric Street Railway and the South Chicago Street Railway, and has increased its capital stock from $1,000 to $5,000,000.

Denver & Rio Grande.—Of this company's new mortgage of $150,000,000, which the stockholders will be asked to approve, $90,000,000 is to be reserved to refund the bonded debt of the Denver & Rio Grande and the Rio Grande Western. The total outstanding funded debt of the company is $84,843,900.

Havana Central.—A special meeting of the stockholders has been called for June 15, to authorize an issue of $3,500,000 bonds.

Manhattan Railway (Elevated).—This company, which owns the elevated lines in Manhattan and the Bronx in New York, has applied to the Public Service Commission of the First District for permission to issue $11,712,000 bonds to be used to pay the first mortgage bonds of the Metropolitan Elevated, which fall due on July 1, and to repay the company for the cost of extending lines in the Bronx.

New York & Long Island.—This company—the "Belmont tunnel," New York City, has secured from the New York State Court of Appeals a decision sustaining the validity of its franchise. The litigation over this tunnel, which crosses the East river at 42d street, has been in the courts for more than two years, the city having steadily denied the right of the corporation to construct and operate the tunnel under the old Steinway franchise. Justice Blanchard at the outset of the litigation refused to grant a temporary injunction restraining the construction, holding that if the franchise had really lapsed and the city was entitled to the tunnel rights no harm could come if the construction went on at the risk of the company claiming the right to construct. In November last the Appellate Division sustained Justice Blanchard's contention, holding that a project of such great public importance should not be delayed on the mere possibility that at some future time it might be determined that the old franchise was invalid. It is this decision which has now been affirmed by the Court of Appeals. Meanwhile it has been rumored steadily that the city was about to purchase the tunnel from the Belmont interests, and a formal offer to sell for $7,239,476 was made in February by President Shonts to the Public Service Commission. That offer is still under consideration.

New York City Railway.—The U. S. Court of Appeals, in a decision handed down May 20, sustained the order of the Circuit Court authorizing the Receivers to issue $3,500,000 certificates to put the roads in their charge in shape.

New York, New Haven & Hartford.—Kidder, Peabody & Co., Estabrook & Co., and R. L. Day & Co., of New York and Boston, Mass., are offering $4,000,000, first mortgage, 4 per cent., 50-year bonds of 1904-1954 at 98. This is the balance of $15,000,000 bonds authorized under this mortgage.

Northern Texas Traction.—Estabrook & Co., and Lee, Higginson & Co., of Boston, Mass., are offering $500,000 three-year, 6 per cent. notes of May 1, 1908-1911, at 97¼, yielding 7 per cent. The Northern Texas Traction runs a street railway in Fort Worth, Texas, and an interurban line between Fort Worth and Dallas.

Seattle Electric.—Lee, Higginson & Co., N. W. Harris & Co., and Estabrook & Co., of New York and Boston, Mass., are offering $2,500,000 Seattle Electric consolidated and refunding mortgage sinking funds 5 per cent. bonds of 1907-1929 at 93½, yielding 5½ per cent.

Southern Railway.—J. P. Morgan & Co. are offering $15,000,000 6 per cent. three-year convertible notes of May 1, 1908-1911, at 98½. Holders of the Southern Railway two-year, 5 per cent. notes maturing on June 1 and July 2 may deposit their notes and will receive preference in the allotment of new notes. Preference will also be given to holders of the Southern Railway stock trust certificates. The new notes are secured by $20,000,000 Southern Railway development and general mortgage 4 per cent. bonds, Series A; $25,000,000 Tennessee Central, prior lien mortgage 4 per cent. bonds, and $2,000,000 Virginia & Southwestern first consolidated mortgage 5 per cent. bonds. The notes may be converted into Southern Railway development and general mortgage bonds.

Tonopah & Tidewater.—It is said that this company has purchased a controlling interest in the stock of the Bullfrog Goldfield railroad, and that the new company will be incorporated under the name of the Tonopah & Tidewater Railway.

Virginian Railway.—Redmond & Co. and the Equitable Trust Co., of New York, have purchased $17,000,000 Tidewater Construction Co. first lien, five-year 6 per cent. convertible notes, secured by $33,500,000 first mortgage 5 per cent. bonds of the Virginian Railway and $3,000,000 first mortgage 5 per cent. terminal bonds. The notes are to be guaranteed unconditionally by H. H. Rogers. These new notes are being offered among the brokerage houses at 99, yielding 6¼ per cent.